ELECTRICAL REVIEW

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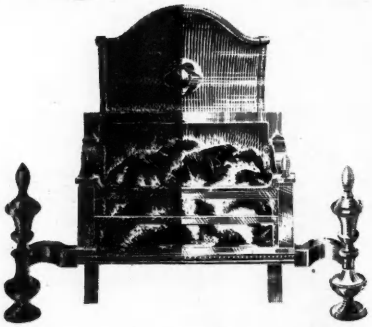

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ELECTRICAL REVIEW

ESTABLISHED 1872

Vol. CXLIII. No. 3704
19th NOVEMBER, 1948

Retarded Development

WHAT ARE THE GOVERNMENT'S INTENTIONS?

MANY people in the electrical industry are becoming perturbed about conditions and prospects and some are becoming suspicious. Everybody realizes that the war stretched the country's industries and general economy to the limit—and beyond—and that progress was bound to be retarded. There has arisen a feeling, however, that retardation of electrical progress has gone too far, due either to an imperfect realization of the consequences or a tendency to ignore them in an attempt to prevent electrical development at the expense of other methods.

Demand and Supply

When the war finished there was, for a short space, a sufficiency of plant but it soon became apparent that industry would have to continue to operate at the high level reached during the war and that the suppressed domestic demand would have to be satisfied. The Central Electricity Board prepared a programme to meet the situation but the Government decided, partly because of shortage of materials and partly on account of the need for economy in capital investment, that the programme should be substantially reduced. The public have been following an ever-receding carrot. They were first told that supply would catch up with demand by 1950. Since then the date has been advanced several times and now 1954 is being mentioned.

To back up its decision the Government has had first to enforce load spreading in industry, which does not conduce to efficient operation, secondly to compel commercial undertakings to reduce their demand, and finally to threaten the domestic consumer with deprivation if she does not keep off the peak. The threat in the last case has been reinforced by a half-hearted attempt to make the cost of electricity prohibitive during the winter.

Increased production by industry is impossible without extending electrification. Our American friends who have come over to advise us on production have already indicated that without the tools (this time electricity) our industries cannot be expected to accomplish the programme which the Government has put before them.

When fuel economy was said to be the first essential electricity consumers were treated very badly in comparison with gas users. Now that plant shortage is the trouble the gas consumer is apparently not affected. Indeed the gas industry has occasionally implied that it is in a position to take over all the domestic water heating and cooking if necessary.

Effect on Electrical Industry

This policy (which is underlined by a punitive purchase tax on water heating and space heating equipment) is now showing its effects. Makers of domestic electrical appliances, deprived of a home market and unable to sell their goods in overseas countries, are having to stand off workpeople or close down entirely and this is likely to spread to other branches.

Thus it is that perturbation and suspicion are about. The suspicion is that the

Government is endeavouring to set back the clock and force the people to use other agents than electricity in their homes. If this is true two important points are being ignored: the people will insist on having electricity if they want it and unless the nationalized electricity service is allowed to develop naturally it will not pay its way. This would be a strange method of "selling" the nationalization idea to the public.

LIGHTNING SURGES

ALTHOUGH thunderstorms cause relatively little trouble in this country, lightning is responsible for the majority of failures of supply from overhead distributors. The survey of existing knowledge of the subject (based on investigations over many years), which was presented by Mr. H. M. Lacey before the I.E.E. Supply Section, formed a useful reminder of how much more investigation is necessary before reliable protection is forthcoming. Protection against all contingencies would be wasteful; the cost of safety is analogous to an insurance premium, and the amount spent needs to be related to a calculation of chances of damage. Doubt is often expressed as to whether some palliatives extensively adopted in the past have been worth the expenditure incurred.

WATERWORKS PUMPING

THE large amount of energy required, often continuously, for various pumping services in a waterworks makes it a most desirable load for a public supply system. Yet the amount spent annually by the Metropolitan Water Board on coal is nearly seven times its bill for electricity, and the cost of fuel oil is as much as 80 per cent. In the paper he presented before the I.E.E. Utilization Section Mr. T. P. Wakeford showed the effect of the "coal clause" which reflects the present inequitable charges for low-grade power station coal. Another adverse sign of the times is the need felt for stand-by where electricity provides the motive power.

RESTRICTIONS REMOVED

ANY relaxation of the controls and restrictions under which industry still operates is to be welcomed even if the benefits to be derived are problematical. The long list just issued of goods which are now free from licensing requirements includes electrical equipment of various kinds. Manufacturers will still be expected to contribute their proper quota to the export trade but they will do it voluntarily; the Minister of Supply will continue to advise manufacturers on the division of their products between home and export markets. Steel will still be the subject of allocation by the Ministry so that it cannot be said that production will be entirely unrestricted. The Minister of Supply has acceded to a request from the Minister of Fuel and Power that electrical water- and space-heating appliances should remain subject to licence.

REPORT FROM BURMA

WHEN Mr. E. A. Logan left Erith two years ago to take charge of the Burmese electricity supply system he entered upon a colossal task. After the devastation caused by the war he had practically to start from scratch and in this issue we publish a brief report of his broadcast talks on this and related subjects. If Mr. Logan could have found developed water power in Burma his job would have been simpler but the harnessing of the country's water resources (a most difficult matter) is still only in the survey stage. He had to make do with what he could get and was able in a short time to provide at least a supply for lighting and the more essential purposes. Now, although plant and equipment are more easily available, there are few trained engineers and until this gap is filled the provision and maintenance of an adequate electricity supply will remain a distant prospect.

AMERICAN COMMENTARY

COMMENTING on the increases in electricity charges instituted by the British Electricity Boards the New York *Electrical World* says that more astute politicians would have waited until the existing undertakings had adjusted their charges to an economic level before proceeding to nationalization. Our contemporary pays this tribute, however:—

> "At least the nationalists cannot be accused of concealing deficits as the public power agencies here are prone to do. When the operation fails to pay its way, the thing to do is to admit it and openly rectify the situation. That is what the British board appears to be doing."

Power Transformers in Factories

Installation and Maintenance

By "ROTOR"

THE main step-down transformer is probably the most important point of a modern industrial plant but, being a static piece of apparatus needing little attention, is apt to get small consideration. It must be correctly installed, and examined periodically to locate and rectify any adverse condition and avoid risk of breakdown.

The transformer may be dispatched from the maker's works with all fittings in position and oil-filled to the correct level. This minimizes the risk of moisture having condensed in the transformer. When received it should be examined, with special attention to porcelain insulators for cracks caused in transit and to the tank for damaged joints. For thorough examination it should be lifted from its tank to inspect windings, connecting leads and insulation for signs of abrasion and to ascertain that all securing nuts are tight, the inside of the tank being examined at the same time. The links on tapped transformers should be checked with the maker's diagram to ensure correct position. Gaskets should receive minimum interference and metal surfaces of joints should be smeared with vaseline. Any transformer not required at once should be stored in a dry position.

If the oil is forwarded in separate drums, these should be examined to ensure the seals are intact and placed in a dry, preferably warm position, lying on their sides with their bung holes at the bottom. This avoids condensation of moisture in the dished ends. The drums should not be opened until they have reached room temperature. Oil samples may be tested for moisture, especially if the seals have been broken in transit. A simple test can be made by stirring the sample with a metal rod heated to dull redness. Presence of moisture is denoted by a "crackle." A better test is by measuring dielectric strength. The sample should withstand 30 kV for one minute between 0·5-in. diameter electrodes spaced 0·15 in. apart. These tests may be made by the manufacturer, supply authority, engineering insurance company or the National Physical Laboratory. Scrupulous care should be taken to avoid moisture or other foreign matter entering an oil sample. Comparatively little moisture may cause considerable reduction of breakdown strength (Fig. 1).

A sample may also be tested from a transformer received with its oil filling. If only little moisture is indicated its removal may be possible by passing the oil through a filter press, centrifugal purifier, stream-line filter or Metafiltration plant. If much moisture is present the whole transformer will probably need drying out.

The tanks of transformers dispatched without oil should be thoroughly cleaned internally in a dry position to remove any moisture condensed in the tank. As such transformers may have absorbed moisture in transit, especially if delayed, they should be dried out just before use. Before opening up, the transformer should stand until it has reached room temperature. Drying may be done by resistance units evenly distributed over the tank bottom, or by supplying the primary or secondary winding at a suitable voltage while the other is short-circuited, the transformer being oil immersed. Large transformers having strong tanks are sometimes dried out by short-circuit currents while under a vacuum of about 25 in. of mercury. With this method the temperature involves little risk to the insulation of the windings, since water boils at only 135 deg F (57 deg C) at that pressure. Oil may then be admitted to the tank under vacuum, avoiding air bubble formation in the interstices of the windings. Another method uses dry air at about 185 deg F (85 deg C).

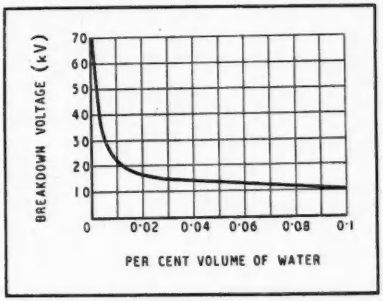


Fig. 1.—Effect of moisture on breakdown strength of transformer oil (0·5 in. diameter disc electrodes 0·2 in. apart)

When resistance units are used no part of the transformer should reach too high a temperature lest the insulation be damaged or oil sludging occur. The top of the oil should be maintained at about 175 deg F (80 deg C) for Class B or 212 deg F (100 deg C) for Class A oil. When drying out by short-circuit currents the temperature should be measured by spirit rather than mercury thermometers, as eddy currents generated in the latter may affect the readings.

Alternatively, the temperature can be checked during drying by passing d.c. through the windings and measuring their resistance, using the formula $T_h = \frac{(234{\cdot}5 + T_c)R_h - 234{\cdot}5\ R_c}{R_c}$; where T_h and R_h are the temperature in deg C and resistance in ohms when hot, and T_c and R_c represent cold conditions. The calculated temperature should be about 212 deg F (100 deg C), since the insulation may be damaged above 220 deg F (110 deg C).

During drying periodical tests of insulation resistance between each of the windings and core, and between windings, should be made. These values plotted against time (Fig. 2) will indicate the resulting dryness. Insulation resistance usually falls at first, then remains steady for the long period of moisture expulsion, rising when the transformer is dried out. It may be necessary to draw off oil from the tank bottom and return it to the top periodically, or to let the transformer cool down once or twice.

If the transformer is satisfactory it may be topped up with oil. At normal room temperature there should be about 2 in. of oil in a conservator vessel (if fitted). Before switching on, the transformer should stand for a few hours to let air bubbles rise; occasional agitation of the oil will help to dislodge any air trapped round the coils or core.

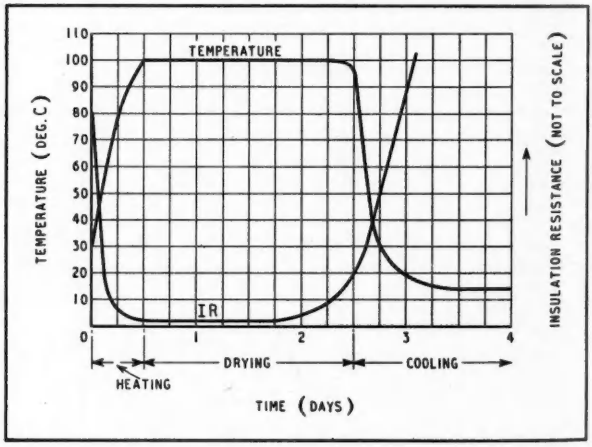


Fig. 2.—Drying-out curves of transformer

To ensure maximum life with minimum trouble the transformer must be placed in a well-ventilated position and protected from rain or dripping water. It should be at least 2½ ft from a wall, any two transformers being not less than 3 ft apart. Sufficient head room is desirable for raising the transformer from its tank on site. If an overhead crane is not available a steel joist may be erected over the transformer for handling by chain blocks. Ground clearance should permit of placing a small receptacle below the drain valve to receive oil samples.

An oil-immersed transformer may be a fire risk if air is present to support combustion and the oil is heated to self-ignition temperature or heated above flash point and ignited by an external arc or flame. The flash point of transformer oil is some 117 deg F (65 deg C) higher than the maximum working temperature; normally protective devices should de-energize the windings long before a fault has heated the large quantity of oil to its flash point, but this may be lowered by the oil "cracking" due to severe heating or discharge in it. Fires have been caused by short-circuit arcing near the terminal gear, or corona discharge from sharp-edged or small-diameter conductors at very high voltage. Such faults may cause ignition of oil-vapour mixtures near the tank top, thereby bursting the tank and releasing burning transformer oil.

To avoid risk of spread of fire, a concrete trench nearly filled with pebbles or granite chippings should be provided round each

transformer and associated circuit breaker and perhaps covered by an open grating. The trench capacity should suffice to contain the oil without its rising within 2 or 3 in. of the surface of the chippings. Each item needs a separate trench; alternatively, walls or curbs may be built round each item to restrict oil escape. Main cables to the transformers are best run overhead; if fitted in trenches these may have a sand or pebble filling with sand stops at walls or similar positions, and covers to restrict entry of burning oil.

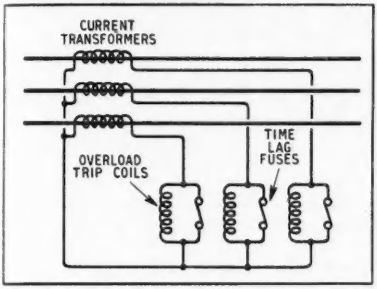


Fig. 3.—Connections of current-transformer operated overload trips with time-lag fuses

The structure and doors of a substation should be able to contain a fire for a considerable period. Where a substation is below buildings its ventilation system should be entirely separate from theirs. A thermostatic device to give audible warning of excessive temperature rise, particularly with water-cooled or forced-cooled transformers, and a remote control to switch off the transformers in emergency are advantageous. Fire extinguishers should be provided in the substation, and in the case of large stations a fixed system is advisable.

Transformers to be operated in parallel should have secondary voltages as nearly identical as possible to avoid circulating currents at all loads. When first put into commission a transformer should be left on "no-load" or on low-voltage short-circuit current for a few hours before use to minimize absorption of moisture and to allow the windings to settle down and air bubbles to be dispersed. Condensation of moisture in stand-by transformers may be minimized by using them in turn.

Before energizing the transformer the breathers, if fitted, should be checked to ensure correct charging and dryness of contents. The protective devices should be adjusted to trip out the transformer in the event of dangerous overload or electrical fault. This is particularly necessary for transformers in parallel, as switch tripping due to a fault or vibration may otherwise overload the remaining transformer or transformers. A simple overload protective circuit (Fig. 3) is sometimes used for the secondary side of a small transformer. Adjustment of trip setting and time lag is by various sizes of time-limit fuses (Fig. 4). Earth-leakage and overload trips are used on the primary side of some step-down transformers (Fig. 5).

If a transformer can be raised from its tank after about six months' use any slack coils can be tightened by means of packing

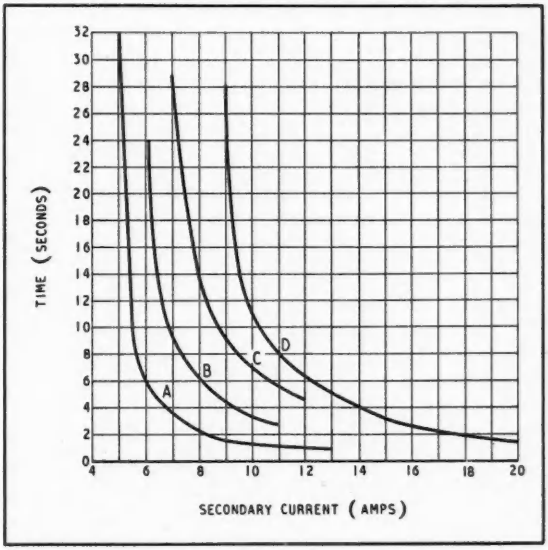


Fig. 4.—Characteristics of lead time-limit fuses

A, one strand 0·024 in. dia; B, one strand 0·028 in. dia; C, one strand 0·031 in. dia; D, two strands 0·028 in. dia

or by adjustable clamps, if fitted, so as to avoid vibration. Loose core or terminal bolts should also be tightened. It is useful to measure the resistance of the insulation of bolts passing through the core, as its failure may allow excessive eddy currents to circulate, causing rise of transformer temperature and possible damage to windings and core. The insulation resistance of the windings may also be tested, preferably when they are warm.

Periodical Attention

A general inspection should be made every few months. The oil level should be checked, bearing in mind that expansion will result in its rise when the transformer is hot. It

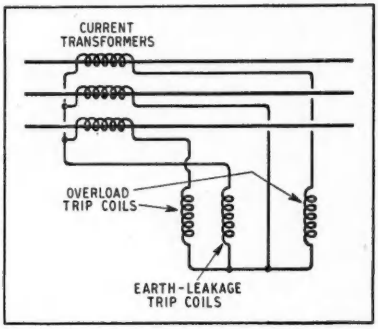


Fig. 5.—Connections of overload and earth-leakage trip coils on three-phase circuit

should not fall below the bottom of the gauge glass even when the transformer is cold, as reduced radiating surface will cause increased temperature rise. Tops of cooling tubes should be well covered. Oil may be lost in time due to faulty joints, leaking drain valve or oil gauge, oxidation or evaporation.

The transformer loading should be checked with the instruments fitted, and the hottest part of the oil tested by thermometer. High temperature may indicate overload, faulty ventilation, failure of water supply or scaling of the cooling tubes of a water-cooled transformer, oil sludging or electrical fault. Any transformer reaching 195 deg F (90 deg C) should be switched out for investigation.

Earthing connections may need checking to ensure tightness, freedom from corrosion and connection to an efficient earthing point. The air drying agent of the breather should be renewed if necessary. In a moist atmosphere calcium chloride may deliquesce and the breather need recharging with pure fused

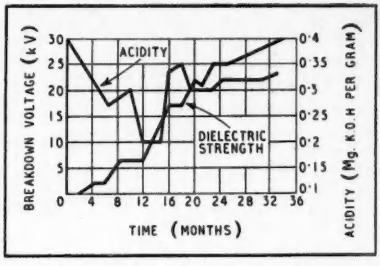


Fig. 6.—Test results on transformer oil

anhydrous calcium chloride of medium mesh. In a silica-gel breather moisture is mainly condensed in the charge, which turns from blue to pink and may be re-activated by expelling warm dry air from the heated transformer. If moisture is indicated when the transformer is hot a new charged container should be fitted. The old charge may be re-activated by stoving at 570 to 750 deg F (300 to 400 deg C) until the blue colour returns, the container then being sealed while hot.

Any moisture trapped in the bottom of a conservator vessel should be drained off. Protective trips need checking to ensure correct adjustment and freedom to operate. Time-lag fuses in parallel with overload trip coils need examining as, if these have melted, the trips will function instantaneously should the current reach the trip setting. Insulators should be cleaned with a dry cloth after ensuring that circuit breakers and isolators are "off." Both primary and secondary sides of a transformer in parallel with others should be isolated before touching any insulator or conductor. Insulator resistance of the windings should be tested if possible while the transformer is hot, and the results compared with previous tests or those on similar transformers. A low reading may be due to moisture or acidity in the oil.

Oil Treatment

An oil sample from the bottom of the tank should be tested, normally once a year. The dielectric strength test between 0·5-in. diameter electrodes should preferably exceed 20 kV for a gap of 0·15 in. or 15 kV for 0·1 in.

Sludging and acidity may occur in a transformer by chemical action, accelerated by heating in the presence of oxygen or contact of the oil with catalysts such as copper or its alloys, iron or lead. Sludge in ducts and on

cooling surfaces tends to raise the temperature with cumulative effects, so the oil should be filtered every three years or so or when moisture is present in it. Acidity may be shown by smell or by low insulation-resistance tests even after filtering. Ageing of transformer oil depends on many conditions, Class B oils generally proving more serviceable than Class A. In a freely ventilated transformer the oil viscosity may eventually increase, together with specific gravity and acidity, while its resistivity decreases and its colour deepens (Fig. 6).

Since high dielectric strength is no certain indication it is wise to check the acidity of the oil, particularly if Class A, periodically. Acid values above about 1 mg KOH per gramme need attention. The tank cover should be inspected for corrosion and the transformer well washed with clean oil before refilling with oil of acid value not greater than 0·1 mg KOH. Acidity should afterwards be tested at frequent intervals and the oil may need filtering often. A transformer badly sludged with oil of high acidity may need washing with a high-pressure water jet and redrying out. Any acid products left on the windings accelerate acid formation in the new oil.

Every few years the transformer may be raised from its tank for general inspection and tightening of loose parts. It may need cleaning and removal of rust or scale from the tank interior and cover, especially if heavily loaded and subject to rapid load changes. When opening up a transformer no exposed flame should come near the tank as an explosive mixture may be in the enclosed space at the top of the tank or conservator. The transformer should be carefully handled as the insulation becomes brittle with age.

Should the water supply to a water-cooled transformer be impure, lime or other foreign matter may in time be deposited in the tubes and need removal, to avoid overheating, by passing dilute acid solution through the coils. Should the tubes become corroded and the oil pressure fall below that of the water, eventual failure may result from water entering the oil.

District Heating

Manchester Corporation and B.E.A.

A SPECIAL correspondent of the *Manchester Guardian* reports that a meeting is to be held on 26th November at which representatives of the Manchester Corporation will discuss with Lord Citrine, chairman of the British Electricity Authority, the terms on which the B.E.A. would be prepared to purchase electricity from district-heating stations.

In the earlier stages of the scheme the Manchester Corporation Electricity Department had agreed to buy energy from the stations at the price it paid for bulk supply from the Central Electricity Board and on this basis it was calculated that the district-heating scheme could be run at rates which would be attractive to householders.

Since then electricity supply has been nationalized and the British Electricity Authority, according to the correspondent, has devised a special form of tariff for electricity supplies from district-heating schemes which would make the Manchester proposals uneconomic.

It is stated that the ostensible justification for the tariff is that fluctuations in the output from district-heating stations, being controlled by the domestic demand for heat, would not necessarily coincide with the fluctuations in the total demand for electricity on the B.E.A. A constant supply could be guaranteed (at a price) by erecting smaller stations, working them to capacity all the time, and storing the surplus heat in warm weather; but this solution is forestalled by a clause in the tariff which heavily penalizes the production of electricity by night.

It is understood that the Minister of Fuel and Power has so far declined to be represented at the meeting and has suggested that if agreement cannot be reached arbitration should be resorted to. In the meantime the Housing Committee is proceeding with the erection of houses on the Wythenshawe estate. Immersion heaters have been installed so far in order to minimize the cost of future conversion to district heating but the Committee has now decided to provide back boilers in future houses although conversion costs will be greater.

Coffee Percolators

THE Commissioners of Customs and Excise state that gas or electric coffee percolators are not chargeable with purchase tax. Domestic percolators without heating elements are also exempt unless they are goldsmiths' or silversmiths' wares (100 per cent) or are made wholly or partly of stainless steel, or are coated or plated with silver or are made of nickel, Britannia metal, nickel silver, pewter or similar metals (33⅓ per cent).

Views on the News

By REFLECTOR

THE enduring youthfulness of some of the electrical industry's elder statesmen is a recurring wonder to me at the E.I.B.A.'s annual ball. For five or six strenuous hours they stay the course and finish as fresh as daisies. This year's ball was well up to the standards of its predecessors but it will be a relief when more space becomes available although then, I suppose, the average space per guest will be no bigger for the limitation on numbers will be raised. I think a special word of praise should go to the manufacturers who presented the most magnificent set of gifts seen so far at this popular event. The possibility of getting one of these made the expenditure worth while, quite apart from the enjoyment of the affair and the glow of satisfaction derivable from augmenting the Association's funds.

✦ ✦ ✦

I have commented before on the irrational desire of some farmers for cheap electricity. What I mean is their demand for installations free of cost to them. The matter recently cropped up again at a meeting of West Riding farmers when it was contended, according to the *Huddersfield Examiner*, that it was the Government's duty to bear the cost of installing electricity at remote farms. Some regard must be paid to economics in this matter; if electrical facilities are to be provided gratis why not roads (or even railway branch lines) to enable the products of these farms to be got away expeditiously. Some assistance may be justifiable on the ground of the importance of food production, but why should the farmer, who will save much labour cost by using electricity, expect service for nothing ?

✦ ✦ ✦

Looking through the fifty-third and last report of the Sunderland Electricity Department I was interested to observe the cycles of development indicated by the figures of consumers connected. From 1896 the number of additional connections grew until about 1901 and then receded to a " record low " in 1910 when the column shows —1. There was then a progressive increase until the war years. The next peak was in 1928 when 2,173 consumers were added, the number falling in the ensuing depression period to 606 in 1931. The following years were among the most active from a development point of view in the undertaking's history with an annual rise in the number of consumers added until the record level of 3,742 was reached in 1937. The report of Mr. W. A. Royle also shows that since 1919 there has been a deficit in only one year, 1932, and for the latest year the net profit was one of the largest ever made.

✦ ✦ ✦

The discussions upon the prevention of interference with radio have tended to cause forgetfulness of interference *by* radio. First there is the interaction of stations operating upon adjacent wavelengths; then there is the intrusion of morse signals (which I suppose are essential); and finally there is the interference with the peace of a neighbourhood by those who let their loudspeakers run riot.

✦ ✦ ✦

" Doggy Remembered to Switch it On " might have been a suitable headline for the report last week of a case in which an old man was summoned for not keeping a dog under proper control. Giving evidence the defendant said:—

> " I leave an electric kettle full of water downstairs before I go to bed, and every morning she pushes down a switch and then comes to my bedroom door to waken me with her barking."

All the same I am dubious about electrically-minded dogs. With their love of comfort they may go around switching fires on during peak hours.

✦ ✦ ✦

An American contemporary carries an advertisement of a company which has developed fluorescent bulbs for Christmas tree decoration and for other special occasions. This is the first instance to come to my notice of this application of fluorescent lighting, although it was inevitable that this form of lighting would in due course be used for decorative purposes in the home.

✦ ✦ ✦

I rather liked Mr. F. P. Phillips' new version of an old saw in his article on " Lift Safety " (*Electrical Review*, 12th November):—" Even a non-reversible worm will sometimes run if once started."

Western Australia Gold Fields

Electricity Distribution Problems

By G. M. DUNBAR,
Associate I.E.E., M.Amer.I.E.E.

THE East Coolgardie Gold Fields of Western Australia cover a vast area, but the largest concentration of mines, producing the greatest proportion of Australian gold, is located within a square "Golden Mile" between the towns of Kalgoorlie and Boulder, which are some three miles apart.

The entire life of the community depends, directly or indirectly, on mining requirements. The surrounding country is unsuitable, due mainly to the lack of fresh water, for farming or other primary industries. As a result of the continuous closing down of low-grade or worked-out shafts and opening up of new ones, areas once thickly populated have now hardly a house on them and those formerly waste land are now thriving suburbs. On that account buildings, except for the larger shops and office blocks in the town centres, are easily removable bungalows constructed of wood or wood frames lined with asbestos sheeting.

Distribution System Requirements

Any system of power distribution for both mining and domestic requirements must therefore be easily and quickly installed or dismantled at minimum cost. The best method is found to be by overhead lines carried on wood poles, and this is used to carry power for the two townships, the surrounding districts and all electrified mines within about twenty miles. Suitable and cheap timber is available within the State, whereas steel must be imported from the Eastern States or abroad. However, the effects of temperature and of attacks by white ants on the wood and the damage caused by thunderstorms considerably affect line maintenance.

During and since the war, well-seasoned timber has been scarce owing mainly to lack of labour and prior calls on the timber industry. This has resulted in the use of poorly seasoned wood to meet the increased demand for new installations and to replace deteriorated poles and cross-arms.

Temperatures in the Fields vary widely, shade temperatures of 110 deg F being frequently reached during January and February when humidity is nil. Most of the little rain (averaging 9·5 in. per annum) falls in the winters, which are cold with frosts and heavy dews. These extremes adversely affect the poles and cross-arms, the hot dry summers causing them to become twisted and warped and to suffer from peeling and splintering. Conductors, where erected soon after the poles and arms, tend to keep the arms more or less square but are themselves with their insulators subjected to additional strain. At least one local authority is attempting to reduce cross-arm trouble by adopting vertical construction, but this is hampered by the present acute shortage of suitable insulators.

Damage by White Ants

Perhaps the largest expenditure on line maintenance is due to white ants. Their attack usually commences at ground level, and unless the poles are frequently inspected damage becomes excessive. Complete treatment as given to fir poles in other parts of the world is not practised, but cross-arms are coated with red lead as initial weatherproofing and pole butts are tar coated to a height of about 2 ft above ground as a temporary deterrent to the ants. If discovered early enough, an attack can be checked for a time by chipping away the affected parts at ground level and again liberally applying tar. If it has penetrated too deeply or a previously chipped pole has again been attacked (assuming the rest of the pole to be in fairly good condition) "slabbing" is carried out.

This consists of digging about 3 ft down the side of the pole, placing a 6-ft section of old railway line in the hole and bolting the slab and pole together above ground. A 6-in. section of the wood just above ground is then cut away; thus, with the wood clear of the ground, further action by the ants is checked and pole life considerably increased. For larger poles carrying heavy lines double slabbing is used, a section of rail being placed on each side of the pole.

During summer thunderstorms of tropical severity, lightning causes considerable damage to the lines and terminal apparatus. Lightning arrestors which provide a path to earth for high-voltage surges require reasonably

good earthing conditions, but unfortunately on the Fields these are so poor as to be almost useless.

Various methods of protection against lightning have been tried. On the high-voltage lines overhead guard wires, earthed at each pole, have not shown sufficiently good results, owing to the poor earth conditions, to warrant the extra cost. The bonding of insulator pins to lightning rods at each pole seemed only to increase the number of line failures. Where an induced surge punctured or spilled over an insulator the apparent result was for the surge to take the bonding path and puncture one of the other insulators.

The most satisfactory and economical protection has proved to be the use of unbonded and unearthed lines, the wood acting as secondary insulator when any of the normal insulators have broken down. This has resulted in fewer service interruptions. For protecting terminal apparatus, lightning arrestors have been provided in situations where artificial earths can be maintained, such as around the premises of large consumers and at power stations.

In the Courts

ISLE OF THANET DISPUTE JUDGMENT

ON 10th November in the King's Bench Division of the High Court, Mr. Justice Morris delivered judgment in a dispute between the Isle of Thanet Electric Supply Co., Ltd., and the South Eastern Electricity Board, successors of the Margate, Broadstairs and District Electricity Board to whom the company sold its undertaking on 1st January, 1947.

The Electricity Commissioners had made an award in arbitration proceedings and the question for the Court was the construction of sub-section 9 and of section 6 of the Margate, Broadstairs and District Electricity Act, 1937, which provided that the purchasing authority " shall discharge all liabilities of the company of sums due from the company in respect of the undertaking as at the date of purchase."

His lordship, in giving judgment, said that the question was whether the words in sub-section 9 were clear and unambiguous and were to be read with their normal and ordinary meaning, or whether there were circumstances calling for a construction which might modify the ordinary meaning. It was said by the Board that unless sub-section 9 was construed as the Board contended, a result would be reached which must be regarded as inequitable and as repugnant to the intention of the legislature. The words did not seem to his lordship to be ambiguous. If it had been desired to refer, not to all liabilities, but only to some, it would have been easy so to do. He held that sub-section 9 must be construed so as not to exclude any liabilities incurred in creating assets which were the subject of payment under sub-section 5 or any liabilities which were represented by assets returned by the company under sub-section 6 and so as not to exclude any liabilities taken into account in computing the amount of gross profit under sub-section 8 (*c*) of section 6, and that the South Eastern Board was liable to repay to the company the amounts discharged by the company in respect of liabilities since the date of purchase.

The Commissioners' award that the South Easter Board should pay to the company £37,744 18s. 8d. now became operative said his lordship.

Injunction Refused

In the Chancery Division of the High Court on 12th November, Mr. Justice Romer concluded the hearing of an action by Electric Transmission, Ltd., of Stoke-on-Trent, against Mr. Kurt Dannenberg, of Friern Barnet, in respect of certain inventions of the defendant.

Plaintiffs are the makers of high-voltage fuses invented by the defendant, who was then in their employ. They pleaded that defendant left them in 1947 and with others formed a company called E.M.P. Electric, Ltd., and was using plaintiffs' patents in breach of an agreement made between the parties in 1940. Plaintiffs now sought an injunction to restrain the defendant from disposing of his rights in his inventions to any others.

Defendant pleaded that the agreement entered into with the plaintiffs was too vague to be enforced, and also that plaintiffs were not entitled to the injunction as it was in the nature of a restraint of trade.

His lordship, in giving judgment, said that in his opinion the prohibitions contained in the agreement were impracticable if defendant left the plaintiffs' employ. He refused to grant the injunction sought and dismissed the claim with costs.

Television Lectures

THREE lectures on television will be given on Monday evenings (8 p.m.) at the Royal Society of Arts, John Adam Street, Adelphi, W.C.2. The first will be on Monday next by Mr. L. H. Bedford, whose subject will be " Some Technical Aspects of Television." On 29th November, Mrs. Mary Adams will lecture on " Television and Education," and on 6th December Mr. Jack Hulbert will talk on " Television and Entertainment."

Vectors of a Two-Phase System

Determining Phase Sequence and Direction of Rotation

By J. W. SMITH, A.M.I.E.E.

THE phase rotation of a two-phase system is an imaginary quantity. In many cases it will have been derived from a study of the original generator connections and

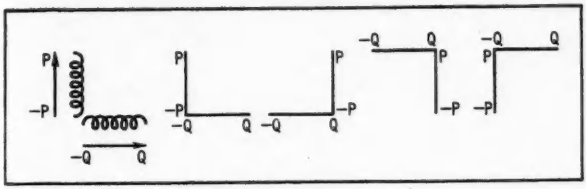


Fig. 1

direction of rotation, in which case it may not be the conventional anti-clockwise direction. The phase sequence of such a system is entirely dependent, in practice, on the polarity of the generator or transformer terminals, which are considered to be common and are therefore earthed. Fig. 1 shows four possible ways of interconnecting the secondaries of a pair of two-phase transformers. The phase rotation is the same in each case, but the phase sequence reverses with each reversal of one pair of transformer connections.

A three-phase rotating phase rotation indicator is often used to check two-phase

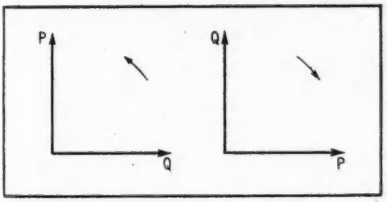


Fig. 2

systems, the three terminals of the meter being connected to the two phases and neutral. If so connected it will give a true indication of the phase sequence but will not check the direction of rotation unless this has previously been established for the system.

For example, consider a two-phase system, P and Q being the phase conductors where P leads Q by 90 deg. If P is connected to the blue terminal, Q to the red and the common to the yellow, a rotating meter will rotate anti-clockwise (if of standard British design), indicating that P leads Q. This condition is satisfied by either of the diagrams in Fig. 2.

The same information can be obtained with a lamp and inductance indicator. In this the inductance leg is connected to neutral and the two lamps to the phases as shown in Fig. 3. The lamp connected to the leading phase will be less brilliant than the other. A cathode-ray oscillograph giving two simultaneous traces can be used for the same purpose.

When it is desired to represent a two-phase system vectorially, the direction of rotation

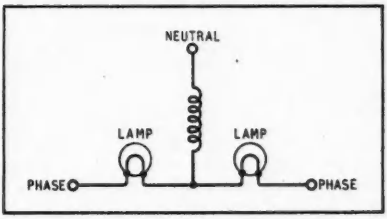


Fig. 3

must be agreed. As the direction of rotation is no more than a convention, the rotation may fail to agree with three-phase vectors when two- to three-phase transformer connections are studied. It is therefore advisable, if possible, to take direct voltage measurements between the two- and three-phase systems. Typical voltage measurements

TABLE I

Two-phase terminal		*Three-phase terminal*	*Volts*
P	to	R	0
P	to	Y	399
P	to	B	399
Q	to	R	325
Q	to	Y	119
Q	to	B	446

obtained for a case where both systems have one phase coinciding and the phase voltage is 230 in both are shown in Table I.

The standard three-phase system is considered to rotate anti-clockwise, so its voltages can be represented vectorially with confidence (Fig. 4(a)). From the inter-system voltage measurements the two phase vectors can be drawn by simple geometric methods (Fig. 4(b)). As the phase sequence of these can easily be determined by the methods previously mentioned, the rotation of the two-phase system is thereby established in an anti-clockwise direction together with the exact relative disposition of the various vectors.

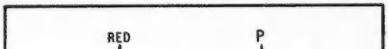


Fig. 4

Vibration Detection

APPARATUS employed for detecting and measuring vibration in gas-turbine components in an aircraft laboratory is the subject of a paper prepared by Mr. R. G. VOYSEY for the Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne.

The paper is based on studies made by Power Jets, Ltd., whose laboratories now form part of the National Gas-turbine Establishment; some of the work carried out with the equipment described has been published elsewhere.

Various methods of detecting vibration are indicated, including electrical oscilloscopes with pick-ups of the acoustic, crystal and capacity types. Reference is made to two wave analysers which were made in the laboratory, but these were not generally so useful as had been anticipated.

The methods used for exciting vibration in bench tests had included bowing as well as pneumatic and electromagnetic devices. Among the last mentioned was a 1,000-W transducer with a 200-lb field magnet, 180-lb field coil and a moving coil drive system. The paper includes details of its design, and of its 150-W and 1,000-W amplifiers, and explains the way of mechanically coupling the workpiece to be fatigue-tested to the transducer vibrator.

Reconstruction in Burma

Reports by Mr. E. A. Logan

MANY readers will remember that about two years ago Mr. E. A. Logan, M.SC., M.INST.C.E., relinquished the position of borough electrical engineer of Erith to become chief engineer and manager of the Government Electricity Supply Department, Burma. This task was the colossal one of restoring Burma's electricity supply system after its virtually complete destruction by the Japanese.

Mr. Logan has sent us the scripts of a series of broadcast talks given by him from the Rangoon station during the past year. In some of these he has referred to the possibilities of developing Burma's water power resources but has had to point out that such schemes cannot be brought to fruition for some years. In the meantime electricity supply has had to be restored by means of small diesel- and steam-driven sets.

In Rangoon supply was restarted with diesel-electric generators installed in the ruins of the Ahlone power station, assistance being given by a steam-driven set in a local factory. Later two 500-kW "portable" steam sets were put in and more recently two 2,500-kW turbo-alternators have been added to the station.

In other places in Burma the Public Works Department has installed plant, mainly to supply Government buildings, and individual licensees have struggled against great difficulties to repair their damaged plants.

Plant has become available for installation in a number of towns but the work is hampered by a lack of trained electrical engineers. Mr. Logan endeavoured in his talks to encourage young men to take up electrical engineering as a career; the Government has instituted training schemes for the purpose.

A.P.L.E. Scottish Section

THE inaugural meeting of the Scottish Section of the Association of Public Lighting Engineers was held at Dundee on 5th November. Among the speakers was Mr. N. Boydell, Eastbourne, national president. Mr. T. M. Lappin, lighting engineer, Dundee, the Section's first chairman, referred to the emphasis laid by the Ministry of Transport on the lighting of main traffic routes in built-up areas, and Mr. C. K. Ross, Edinburgh, pleaded for more co-operation between planning and lighting authorities. Mr. E. Stewart, Glasgow, one of the pioneers of the Association, said that the lighting of side-streets mattered most to the ratepayers. Chief Constable Pattison, Dundee, said that dark, shadowy patches were undoubtedly the cause of many road accidents. He agreed that sodium and mercury lighting were good, but he inclined to the multiple fluorescent type, provided it was mounted high enough.

PARLIAMENTARY NEWS

By Our Special Reporter

MOVING the second reading of the Wireless Telegraph Bill in the House of Commons last week, the Postmaster-General, Mr. W. Paling, said that one of the many differences was that in the new Bill the definition of wireless telegraphy which had to be licensed was extended to include the control of machinery at a distance by wireless. The Bill also defined more precisely the right of British subjects to be granted licences for the purpose of scientific research, but foreigners would no longer get such licences as a right.

With regard to Part II of the Bill which dealt with remedies against wireless interference, his mind was open to any suggestion for an alternative means which would achieve the same end, which was merely to protect the public, and he was prepared to consider carefully all the suggestions put forward at any stage of the Bill. The Post Office was receiving about 40,000 complaints a year from the public The nuisance caused by electrical interference was growing. In a recent case where there were only two complainants it was found that 250 people were suffering. Television was responsible for only one in 15 of the complaints. Some electrical equipment—industrial and domestic—was liable, if not properly screened or adjusted to a safe wavelength, to put out of action altogether the safety landing devices of a neighbouring airport, which must be protected.

The sole aim of Part II was to give him powers to take effective action in the case of the very few selfish people who " would not play," even when it was made clear to them that their appliances were causing undue interference with wireless reception. The Bill did not make it possible for anyone to be prosecuted for not observing the regulations, but it empowered him to serve an enforceable notice on the possessor of apparatus liable to cause interference requiring him not to use it or only to use it on conditions, e.g., at stated hours. But before such notice took effect, unless safety of life was being endangered by the interference, the possessor of the apparatus or anyone interested in it could appeal to the independent tribunal set up under the Bill.

It had been their idea that the provisions of this Bill should be supplemented by discussions with manufacturers to secure their co-operation in fitting products with suitable devices. Such action might supplement, but could not substitute, the provisions of the Bill, because it was not the manufacturers of electrical appliances who caused interference with wireless reception, but the users. The car problem was an increasingly serious one and probably the only effective long-term solution would be for the manufacturers to build devices into the car at the time of manufacture.

Without power of entry as a last resort the Bill could not be effective. The Government would welcome the assistance of the House in solving the problem without any impropriety regarding the privacy of the home, and the committee stage would be taken on the floor of the House.

Mr. Grimston moved an amendment that the House declined to give a second reading to a Bill which contained onerous provisions that could not be justified by public need; which enabled the Postmaster-General to compel citizens to incur expense as a condition of using apparatus lawfully manufactured and acquired; and which conferred on the Government further powers to invade the privacy of the home.

In the debate which followed, Mr. Irvine said that the provision allowing the Postmaster-General to issue a new notice when the first had been revoked by the tribunal was objectionable. Sir H. Webbe said that to fit existing apparatus with a suppressor would cost 10 to 15 times as much as to incorporate a suppressor during manufacture. Interference by electric irons presented a problem which had virtually baffled the scientists. The suppressor was nearly as big as the iron and cost considerably more.

Mr. Hobson, Assistant Postmaster-General, said that during nine months of this year 500 people refused to co-operate out of the 16,000 cases that were investigated.

The amendment was rejected by 256 votes to 96—Government majority, 160—and the Bill was read a second time.

Trafalgar Square Lighting

Mr. Ellis Smith asked the Minister of Fuel and Power why he sanctioned the floodlighting in Trafalgar Square and the use of neon-lighting tubes on the General Electric Building in Kingsway.

Mr. Robens said that the floodlighting in Trafalgar Square was sanctioned in connection with the unveiling of the Jellicoe-Beatty memorial. It was being continued twice a week outside peak hours as an exception to the general restriction on floodlighting which must be maintained for the sake of fuel economy. As regards the use of neon-lighting tubes on the General Electric Building in Kingsway, the question of sanction did not arise. He understood that the neon tubes on this building were merely a replacement and were not for use while present restrictions continued.

Cuts in Supplies

Mr. F. Harris asked the Minister of Fuel and Power if he was aware that the Regional Electricity Boards were infringing his regulations by cutting the supplies of electricity to persons and firms; and what action he proposed to take.

Mr. Robens said that the Area Electricity Boards discontinued supplies only when they were interrupted by technical defects or the demand exceeded the available capacity of generating plant. He was advised that such interruptions in supply were not an infringement of electricity supply regulations.

Mr. Prescott asked the Minister of Fuel and Power if he was aware of the concern arising from the suggestion that electricity supplies might be cut off without warning in any district.

Mr. Gaitskell said he was aware of this concern but general warnings were usually given in announcements by the B.B.C., and in the Press. When it became known that a cut could not be avoided there was not enough time to warn every consumer, but arrangements existed by which as many large consumers as possible received warnings. In addition, there were in most areas rota systems which enabled the consumer to know on which day of the week his supply is likely to be cut.

City of London Load

Mr. Prescott asked the Minister of Fuel and Power whether he would make a statement on the circular issued by the London and South-Eastern Regional Board for Industry relative to reductions in consumption of electricity in the City of London by 50 per cent at peak hours during November and throughout the whole day during the months of December, January and February; and whether he was aware that recipients were asked to sign a form of acknowledgment and compliance; that the terms of the circular were not clear and that full compliance would result in great difficulty for all industry.

Mr. Gaitskell said that the circular referred to was apparently that issued by the City of London Working Committee for Load Spreading to commercial consumers, and therefore the question of compliance by "all industry" did not arise. Attached to it was a printed form of acknowledgment which included the sentence "arrangements will be made to comply with these requirements." It was presumed that those commercial consumers who were unable to make such arrangements struck out this sentence. The circular did not ask for consumption to be reduced by 50 per cent but for load not to exceed 50 per cent of installed capacity, which was estimated would produce the 20 per cent reduction required. He was advised that in general commercial firms understood the position and were co-operating effectively.

Thunderstorm Area Location

Use of Cathode-Ray Equipment

FOR many years now there has been considerable interest in meteorological circles in cathode-ray direction finding equipment for accurately determining the position of thunderstorms. Equipments of this nature, known as "sferics" sets, are now being made commercially by the Plessey Co., Ltd., to a design developed by the National Physical Laboratory for the Meteorological Office. These sets have a range of 1,500 miles and have already been installed at four specially selected sites controlled by the British Meteorological Service.

The apparatus at each station is accommodated in two huts, one of which houses the cathode-ray direction finding equipment, consisting of power supplies, signal amplifiers and display unit. The other contains the aerial system which comprises four multi-turn loops, 6 ft high, two of which are placed in a N-S line and two in the E-W line.

A compass scale is superimposed on the face of the cathode-ray tube for recording the direction of the impulse received from a lightning flash occurring in a storm area. Impulses received from a N-S or E-W direction are picked up by the N-S or E-W aerials respectively, causing a bright line to appear momentarily on the face of the tube, along the corresponding diameter of the scale. Signals from any other direction form a line on the tube screen in an intermediate position.

Although a lightning flash may have a duration of only a few thousandths of a second, the tube after-glow enables the observer to make an accurate reading. In addition, by means of a device known as a "brilliance modulator" only the flashes with amplitudes greater than a predetermined value are shown on the tube.

The receivers operate at about 12·5 kc/s, this being the frequency at which maximum energy is radiated by lightning discharges. Another reason for using this low frequency is the freedom from interference by commercial w/t stations.

The four observation stations are at Dunstable, Camborne, Leuchars (Fife) and Irvinestown (Northern Ireland). Dunstable is the control station of the four and is also the central forecasting station and communication centre of the Meteorological Office.

Observations are made simultaneously from the four stations twelve times daily, between 7 a.m. and 10 p.m. and the results are plotted at Dunstable on a special chart of gnomonic projection. The "fix" is normally taken to be at the centre of the quadrilateral made by the four bearings. The information is then broadcast over the teleprinter network and by w/t enabling pilots of aircraft, particularly those flying over comparatively short routes to the Continent, to avoid storm areas and thus reduce the risk of accidents.

Stand-by Generating Plant

Diesel Power for Factories

By "Installation Engineer"

OWING to the continued restriction of the use of electricity, industrial consumers have been faced with the alternatives of (1) working a night shift, (2) reducing the factory machine load or (3) installing stand-by generating plant to relieve the load on the public supply mains.

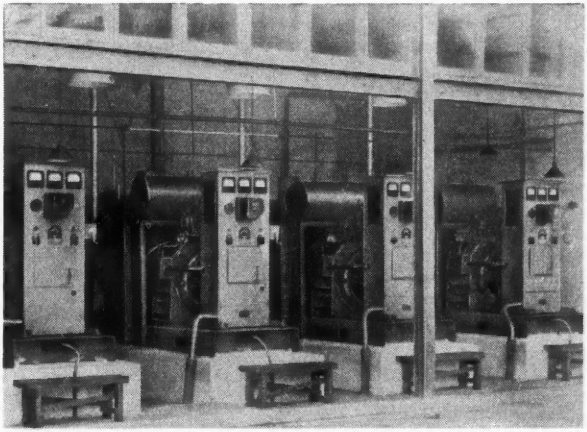
Since the power crisis of the 1946-47 winter, the firm with which I am associated has been engaged as consultants by an important industrial group in an endeavour to install private stand-by plant in a number of factories in various parts of Great Britain.

The general principles laid down by the factory directors were that it would suffice if plant having 50 per cent of the capacity of the normal working load was installed and that diesel generating plant was desirable because of its superior efficiency and convenience. A hasty survey of the machinery installed at the factories to be relieved indicated that generating sets ranging in output from 50 to 500 kVA would be required, so inquiries were circulated to all the well-known engine manufacturers with the result that, although several were able to supply the engines by the date required, they were unable to guarantee delivery of the alternators in less than two years, due to the heavy commitments of the electrical machine manufacturers. However, after considerable investigation we were able to take advantage of a Ministry of Supply allocation of 1,500 sets of 55 kW which had been given to an important group of engine and electrical machinery manufacturers, evidently for the purpose for which we required them.

Our original intention was to install sets of various capacities ranging from 50 to 250 kVA, but as the delivery of the larger sets could not be promised in less than twelve months at least it was decided to standardize on the 55-kW sets delivery of which was guaranteed by the end of 1947.

Before the switchgear and four-core p.i.l.c. armoured cable could be ordered individual investigations were necessary into the load conditions and distribution arrangements in each factory. In view of the fact that the reserve plant was to be capable of carrying only half the normal factory load, each works manager was consulted about the particular section of his works which it was essential to keep going in case of a power cut.

These inquiries produced some rather surprising results; for example, in one case it was essential that the lighting should be sustained, in order that assembly work could be carried on, there always being plenty of stock of piece parts.



Typical factory installation of 55-kW (88-b.h.p.) stand-by diesel three-phase generating sets

By reason of the necessity for working the reserve plant to a fair proportion of its maximum output, it was necessary to allocate its output to a section of the factory which could be served normally by the stand-by generators, but provision had also to be made

in case of emergency to keep production on the move, although possibly at a reduced rate.

It was found that the switchgear problem could be solved by the provision of a series of change-over switches, the number depending upon the flexibility required in the factory distribution. In most cases four-pole single throw switches have been used, one connected to the supply mains and the other to the reserve generator, the two being interlocked by Castell keys, or similar devices, so that it is impossible for the generator output and the mains supply input to be paralleled.

As a precaution against overloading the stand-by sets in the event of a complete power "cut," most of the factory managers have arranged to have distinguishing labels attached to certain non-essential or heavily loaded machines to indicate that they are not to be run under emergency conditions.

Although the winter 1947-48 was a mild one so far as the weather was concerned, the factory stand-by plants proved very useful in enabling manufacturers to reduce their demands on the public mains by the statutory 33 per cent without the introduction of night shifts or other drastic means. In at least one London district the shutting down of the auxiliary plant at the end of April caused such an increase in the load on the local power station that a certain large manufacturer was requested to keep his stand-by plant running early in May while a cold spell lasted.

On the question of running costs, logs of fuel consumption and kW output which were kept over a few weeks' run indicated that, neglecting depreciation and interest on capital expended, the cost per kWh, including labour and maintenance, was very little in excess of the price per kWh charged by the public supply authority.

	Cost per kWh generated (pence)		Average price charged by public authority (pence)
	Excluding labour	Including* labour	
Site 1	1·14	1·92	1·35
„ 2	0·83	1·29	1·09
„ 3	1·07	1·47	1·10
„ 4	1·00	1·39	0·94

* Not including cost of de-carbonizing or major overhaul, which would probably be necessary each summer after the winter run.

In the case of the particular group of factories with which I was concerned, the management was content to regard the capital expended on the plant as an insurance against complete stoppage of work which had occasioned so much financial loss during the previous winter.

The question naturally arises whether, when the present emergency is over, it will pay the manufacturer to retain the plant for use during peak load periods, particularly where the charges are based partly on maximum kW demand, as in such cases the kW charge forms a good proportion of the annual electricity bill, especially with a plant of low load factor.

In order to secure the maximum financial benefit from the stand-by plant, which would normally be run during the winter months only, it will be necessary to arrange if possible with the local supply authority to re-set the maximum demand indicator at quarterly, or even monthly, intervals so that any high demand which may be registered when the stand-by plant is not in use will not be charged for throughout the year.

Tasmanian Water Power

Nive River and Trevallyn Projects

THE Nive River development, preliminary work on which has been started by the Tasmanian Hydro-Electric Commission, calls for the construction of three dams and the creation of a chain of lakes. The two catchments involved—Nive River and Lake Echo—form an extensive plateau area in the centre of the island and the new development, together with another at Trevallyn (primarily for the aluminium industry) will bring under control practically the whole of the run-off from the plateau.

Details given in the Australian journal *Electrical Engineer and Merchandiser* show that a large dam on the Nive River will divert the flow of the river through a chain of five marshes (converted into lakes) and thence via pipe-lines to the proposed Tangatinah power station in the Nive gorge 1,000 ft below. A dam on the Dee river will divert the waters of Lake Echo and the Dee into this system and a low dam at the outlet of Lake Echo will conserve winter rainfall in the lake. The scheme is especially suited to providing peak load capacity which is particularly needed. It is calculated that an average capacity of 65,000 h.p. will be available, but there is considerable scope for expansion of peak capacity and the installation may eventually reach 150,000 h.p. or more. The estimated cost of the project is £7 million.

The Trevallyn scheme, costing approximately £2 million, involves the construction of a power station at sea level and works to bring water from the Second Basin in the South Esk to the Tamar, about two miles from Launceston. Plant with a capacity of 60,000 h.p. will be installed.

E.I.B.A. Annual Ball

ONCE again the annual ball of the Electrical Industries Benevolent Association, held at Grosvenor House, Park Lane, London, last Friday, proved an outstanding success. As accommodation was limited many applicants for tickets had to be disappointed and the total of 600 could have been considerably exceeded if space had been available.

Above :—Mr. L. C. Sharp's table. Left :—At the President's table : Messrs. V. W. Dale and Raymond Berry are seen in the foreground. Below : Sir John Dalton, Mr. C. Parker and friends

Mr. A. G. Beaver, the president, and Mrs. Beaver received the guests as they arrived and leaders in all branches of the industry were included in the company.

Oscar Rabin's band provided the music and a cabaret show was given by the Botonds, Ronald Boyer and Jeanne Ravel, and the Radio Revellers.

During an interval Mr. Beaver commended the Association and its work to all present, although he confessed that he was obviously preaching to the converted. He expressed the hope that the Association would not be forced by lack of funds to "shed load." He made special reference to the national golf competition and thanked Sir Montague Hughman for presenting a cup (which was on view) and Mr. Alan Hughes for organizing the competition which had resulted in augmenting the E.I.B.A. funds by £430.

(*Continued at foot of next page*)

Mr. E. G. Batt congratulates the winner of the refrigerator (Mrs. W. Lewis Smith) after its presentation by Mrs. Beaver

C†

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Common Neutrals

I AM changing over from d.c. to a.c. supply in the railway premises at Ferozepore Cantonment, in India, by running separate wires for the a.c. system. In most

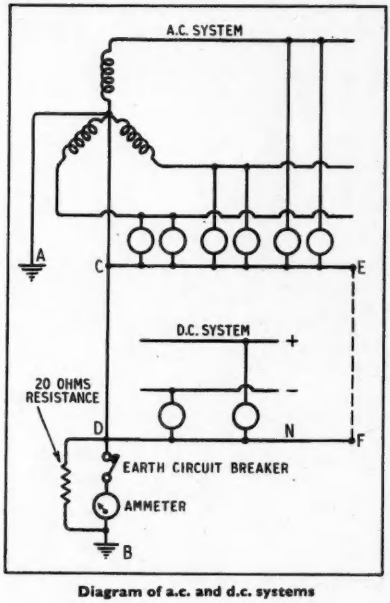


Diagram of a.c. and d.c. systems

cases the outer wires can be changed over without much interference, but the running of a separate neutral presents a problem. To accelerate the work I am considering utilizing the existing neutral for both d.c. and a.c.; this appears to me free from serious objection.

Both a.c. and d.c. neutrals are earthed in the railway power house, and we cater for the railway load only. The earth resistance at A and B being the same, the potential difference at points C and D should not vary and the connection of these two points should not interfere with the working of both systems independently. Therefore the connection of both neutrals, at a distance, E and F, should be permissible.

I have already experimentally connected a.c. and d.c. loads with a common neutral and a laboratory test indicates that during an out of balance in either system the current from the neutral is filtered at the power house and diverted to the system on which the out of balance takes place, i.e., to the transformer or the three-wire balancer. Objection has been raised that the potential between any a.c. phase wire or d.c. outer and the neutral may increase to a dangerous point. I should be glad to have the views of your readers on the subject.

NAUBAT RAI,
Ferozepore, India. *Divisional Electrical Engineer,* Eastern Punjab Railway.

Freedom and the Engineer

MANY of us in the electrical engineering profession, who are profoundly disturbed at the trend of political and economic affairs, will no doubt welcome the example of the medical profession who under Lord Horder have formed the "Fellowship for Freedom in Medicine." At the opening meeting Lord Horder declared: "The living power of medicine has passed out of the profession to be lost in the dead machinery of the bureau. We are no longer experts. We sit and sign forms . . ."

Have not engineers similar grounds for concern with regard to the future of their own profession? And has not the time arrived to call a halt to the encroachments of that bureaucratic disease known as "Planitis?"

I would suggest the formation of an organization known as the Fellowship for Freedom in Electrical Engineering, to function hand in hand with similar organizations in other professions. I should regard such a body as ranking at least equally in importance with the Institution of which I have the honour to be a member.

Birmingham, 13. M. W. SINGER, M.SC., M.I.E.E.

E.I.B.A. Ball (*continued from page* 785)

Later, it was announced that the collection which was made at the tables had realized £79 10s. and that £138 12s. had been received from the sale of programmes. Thirty-three manufacturers gave over forty prizes, prominent among them being a "Prestcold" refrigerator, presented to Mrs. W. Lewis Smith and an "Electric Hostess" set (L. G. Hawkins, Ltd.) which went to Mr. E. Chennox. An "Ultra" television set had not been claimed at the time of going to press.

Public Health Exhibition

WIDE VARIETY OF ELECTRICAL ITEMS DISPLAYED

THE wide scope of the subjects covered by the Public Health and Municipal Engineering Exhibition and Congress at Olympia, London, this week is reflected by the diversity of the electrical appliances on view. Held for the first time since the war, the exhibition deals, among other things, with water supply and purification, street cleaning and refuse collection, building and road making, safety on the roads, cleaning and disinfecting, vermin and pest destruction, food preparation and handling, and hospital equipment.

A comprehensive display of electrical equipment is to be seen on the General Electric Co.'s stand

How electricity aids cleanliness and the hygienic handling of food is demonstrated by a particularly striking display by the British Electrical Development Association. In a fully equipped kitchen suitable for school, hospital or industrial or commercial canteen can be seen the latest types of food mixers, vegetable peelers, steaming and roasting ovens, bains-marie, hotplates, grillers, vegetable boilers, water heaters and boilers and hot-cupboards, with a dish-washer in a separate room. The menace of the "communal towel" is solved by the use of an electric hand-dryer.

Stressing the need for as high a standard of electrical equipment in permanent housing as in prefabricated dwellings is a domestic kitchen exhibit, two models also showing how kitchen layouts can be planned. Photographs indicate electricity's part in street lighting, hospital, industry and transport, while the Association's latest colour film, "Clean Milk Production with Electricity," draws further attention to the use of electricity in safeguarding health.

On the General Electric Co.'s stand are examples of lighting, ventilating and catering equipment, and a variety of electrical fittings of particular interest to hospitals and public buildings. A fluorescent lighting fitting for

A kitchen suitable for schools, hospitals, etc., forms a part of the British Electrical Development Association's display

operating theatres utilizes five " Osram " 80-W fluorescent lamps as the main light source. By means of a high-efficiency reflector system the unit produces an intensity of 300-400 lumens per sq ft on the table when mounted 3 ft above it. Four 100-W lamps in parabolic reflectors fitted with glass diffusing screens can be connected to an independent power supply for emergency lighting. Heavy-cooking equipment, a luminous call system, and " Mutac " silent switches for a.c. circuits are other items of interest to hospitals and health services. Indoor cleaning equipment includes vacuum cleaners and floor polishers, and ventilation is represented by " Xpelair " fans. A street lighting exhibit includes many lanterns for main and side roads.

The problems of recruiting staff, particularly in the field of public health, emphasize the many ways in which communication and signalling systems can save time and effort in the administration of public services. Exhibits on the Standard Telephones & Cables' stand show various systems in action, including an automatic loud-speaking master station, a secretarial telephone system, a 25-line private automatic telephone exchange, and a staff locating system. Working models demonstrate typical uses of " Interphone " systems, direct-line " Intercall " telephones, and field telephones, a patients' call system for hospitals and a fire alarm system. Other " Standard " products of interest to municipalities are remote control and supervisory systems, street lighting control (d.c. bias), public address equipment, and electrode soldering hand and bench tools. The " Medresco " hearing aid, manufactured by the company's subsidiary, Kolster-Brandes, Ltd., is also on view.

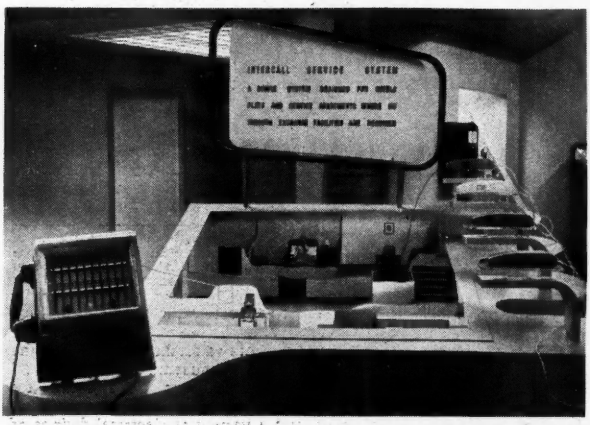
The latest " Rythmatic " ripple control equipment for the centralized control of street lighting is demonstrated by the Automatic Telephone & Electric Co., which also makes a special feature of its vehicle-actuated traffic signals. Illuminated traffic signs are shown by both Gowshall and Franco Traffic Signs.

Portable generator sets are shown by Thomas W. Ward and Arthur Lyon, while Associated British Oil Engines have a self-contained stand-by emergency 55-kW diesel set. The Consolidated Pneumatic Tool Co. has a comprehensive display of portable electric tools.

Of special interest on E. P. Allam & Co.'s stand are electric bar cutters, elevators and vibrators. The " Westool-Stewart " high-frequency vibrating hand tool to be seen on the Westool stand is particularly useful for the vibration of those types of work which do not lend themselves readily either to table or to internal vibration. The vibrator operates electro-magnetically at a frequency of 6,000 vibrations per minute by means of an armature floating between springs designed to resonate with the magnetic impulses of the main magnet system. A range of a.c. and d.c. solenoids is also shown by Westool. Fixing problems of all types are dealt with by Rawlplug, while screening, grading and filtering matters are handled by G. A. Harvey & Co.

Floor surfacing can be specially carried out with the aid of the " Nufloor " machine shown by Floor Renovations, while scrubbing and polishing can be dealt with by " Dixon " and " Columbus " machines made by R. G. Dixon & Co., and Rollnick & Gordon. Vacuum cleaners are shown by Hoover (who are also demonstrating their new washing machine); Electrix; and Electrolux, who make a special feature of refrigerators. A full range of both domestic and industrial refrigerators is included in the display of Le Bryan Group Products, and deep freezers accompany unit heaters on the Copperad stand. The Bendix home laundry is demonstrated. Dish washers, potato peelers, bread buttering and slicing machines, food trolleys and knife cleaning machines are specialities of the Avamore Engineering Co. Ventilating units are shown by Vent-Axia.

Electric refuse collecting vehicles are represented by Brush and Walker-N.C.B. models. Electrical instruments for measuring chlorine residual and automatic adjustment of feed-rate are shown by Wallace & Tiernan, while recorders and integrating instruments for waterworks are made by the Lea Recorder Co.



A model of the " Intercall " service system for hotels, flats and service apartments is to be seen on the stand of Standard Telephones & Cables

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE General Council of the Engineers' Guild has appointed **Mr. W. L. Henderson,** A.M.I.E.E., to the position of assistant secretary to the Guild. Mr. Henderson received his early training with W.T. Henley's Telegraph Works Co., Ltd., after which he was engaged as a commercial engineer with Central London Electricity, Ltd. During the war he served with the Royal Engineers and was finally appointed personnel selection officer to the Corps. He has spent the last two years with the Association of Supervising Electrical Engineers.

As we briefly announced in a recent issue, **Mr. G. Davidson,** M.I.E.E., has been appointed assistant general secretary, and **Mr. B. H. Gurr** assistant secretary, of the Association of Supervising Electrical Engineers.

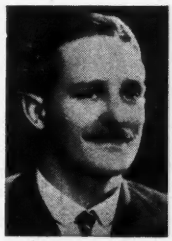
Mr. Davidson served his apprenticeship in the engineering department of Mann, Crossman & Paulin, Ltd., London, and after a year as electrical technician with the R.A.F. during the 1914-18 war, he held positions with Jacob White & Co., Ltd., and Grierson, Ltd. His subsequent appointments included associate director with the Dulrae Manufacturing Co., Ltd., and manager of the heating department of Ellis & Ward, Ltd. For eight years he was manager of group "C" contracts with Duncan Watson (Electrical Engineers), Ltd., and during the past six years he has been employed as senior assistant engineer with Kennedy & Donkin. Mr. Davidson takes up his new position on 1st December.

Mr. Gurr, who is well known in the Association as the secretary of the South-East London Branch, had his early training with W. T. Henley's Telegraph Works Co., Ltd., on machine work and in the research department, followed by installation and maintenance experience with the Thames Metal Works, Northfleet. After service in the Royal Engineers he became domestic electrical engineer with the Reliance Electrical Co., Ltd., and technical adviser on lighting problems and sales engineer with Brown Bros., Ltd., and production engineer with the Ministry of Supply. He resigned the last-named position to become technical representative of Courtney Pope (Electrical), Ltd. He was awarded the Swann Diploma in 1948. Mr. Gurr commenced his new duties on 1st November.

Mr. B. H. Gurr

Mr. G. Davidson

Mr. R. M. Fairfield, B.SC.(ENG.), M.I.E.E., M.I.MECH.E., M.AMER.I.E.E., has taken up the position of general manager of the St. Helens Cable and Rubber Co., Ltd., and of Veedip, Ltd. Mr. Fairfield was educated at King Edward's School, Bath, Erith Technical College and the University of London. He obtained his practical training with the Newport (Mon.) Corporation Electricity Department, and in the workshops and laboratories of Callender's Cable and Construction Co., Ltd., Erith, Kent. His practical experience commenced with two years' research on high-voltage cables, and was followed by three and a half years with the Mullard Radio Valve Co., as superintendent in charge of valve production. In 1937 he rejoined the Callender Co. to take charge of the technical organization of the company's rubber cable factory in Lancashire and, in 1942, his responsibilities were extended to include the paper cable factory in Kent. Following the amalgamation of the Callender and B.I. companies in 1945, he was appointed chief engineer (designs and processes) responsible for the technical organization of the B.I.C.C. factories, and continued in this capacity until he took up the present appointment. Mr. Fairfield served as a member of the Transmission Section Committee of the Institution of Electrical Engineers and was a member of the Cable Makers Technical Committee set up by the Government during the war to advise on all technical matters relating to electric cables. He is a director of Veedip, Ltd., and Rotunda, Ltd., and was a director of the Craigpark Electric Cable Co., Ltd., from 1945 to September of this year.

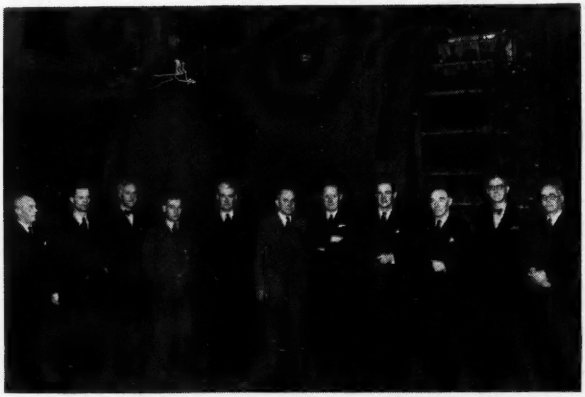


Mr. R. M. Fairfield

Mr. J. W. Davies, general manager and director of Ferranti, Ltd., has just completed fifty years' association with the company. To commemorate the occasion he received from Sir Vincent de Ferranti and Mr. Denis de Ferranti a gold fountain pen, and from the company a cheque. Workers in all departments subscribed to a number of other presentations.

Mr. Davies joined Ferranti, Ltd., in 1898. He became general works manager in 1924 and in 1942 was elected to the board.

Two United States members of the Anglo-American Council of Productivity, **Mr. Philip Reed**, chairman of the General Electric Co., U.S.A. (leader of the American delegates) and **Mr. H. Brown**, president of the International Association of Machinists, U.S.A., recently visited the Trafford Park works of the Metropolitan-Vickers Electrical Co., and in the accompanying picture we show them with Mr. B. H. Leeson, Director of B.E.A.M.A., Mr. A. Hatton, representing the Confederation of British Trade Unions, and Metropolitan-Vickers directors. Behind the group is the 75-ton stator of a 30,000-kW, 33-kV, 3,000-r.p.m. alternator for Belfast Corporation.



Mr. Philip Reed (chairman of the General Electric Co., U.S.A.) and Mr. H. Brown (president, International Association of Machinists, U.S.A.) at the Metropolitan-Vickers works

Left to right: Messrs. F. J. E. Tearle (director, M.-V. Export Company), R. H. S. Turner (superintendent, M.-V. Plant Department), J. G. Lowe (secretary and comptroller, M.-V.), A. Hatton (area organizer, E.T.U.), W. Symes (director and works manager, M.-V.), Harvey Brown, I. R. Cox (managing director, M.-V.), Philip Reed, E. W. Steele (director and general manager of works, M.-V.), B. H. Leeson (Director, B.E.A.M.A.) and Dr. C. Dannatt (director and chief electrical engineer, M.-V.)

Mr. W. Guthrie, B.SC., A.M.I.E.E., lately electrical engineer to the North of Scotland Hydro-Electric Board, has joined Messrs. Strain & Robertson, Glasgow, consulting engineers, as a partner. The name of the firm will remain unchanged.

Following on the death of Sir Arthur Whitten-Brown, **Mr. J. S. Hall** has been appointed acting manager of the sub-office at Swansea of the Metropolitan-Vickers Electrical Co., Ltd. Mr. Hall jointed the Metropolitan-Vickers Co. as an apprentice in 1921 and in 1924 he took up an appointment with Babcock & Wilcox and spent some time in Russia for that company as supervising erection engineer at Shterovka power station. He returned to Metropolitan-Vickers in 1926, and after two years in the Meter Sales Department he joined the Cardiff office staff as sales engineer. He transferred to the Bristol office in 1937, and in July of this year joined the staff of the company's Swansea office.

Mr. W. M. Furniss, chairman of the Electric Construction Co., Ltd., invited his co-directors and executive staff to dinner on 4th November to celebrate his appointment as chairman. Among those present were several whose service covered the whole of the forty-five years during which Mr. Furniss has been associated with the company. Short speeches were made by everyone present, each of whom related some incident or anecdote connected with his service with the company.

Mr. W. Campbell Allan is to retire from the secretaryship of Richardsons, Westgarth & Co., Ltd., and associated concerns at the end of the year. He will continue as a director of the companies. His successor as secretary will be **Mr. F. R. Moberly.**

The first post-war dinner of the Birmingham Branch of the **Electrical Contractors' Association** was held on 5th November in Birmingham. This took the form of a ladies' evening, and 175 members and guests attended. At the dinner the speakers included Alderman W. Lewis, chairman of the Midlands Electricity Board, Mr. Walter Higgs (Higgs Motors, Ltd.) and Mr. J. G Briggs, president, E.C.A. The chairman of the Birmingham Branch, Mr. G. N. Walker, presided. During the evening a collection for the E.I.B.A. realized £20.

We regret that by an error in our last week's issue it was made to appear that Mr. H. Angus (speaking in the I.E.E. discussion on high-voltage d.c. transmission) was Swedish. Actually **Mr. J. Houston Angus**, M.I.E.E., is head of the Electric Power Section, Economic Commission for Europe, in Geneva; he had just returned from a visit to Sweden.

Mr. Ronald Ogden has been appointed general secretary and public relations officer to the British Association for Commercial and Industrial Education in succession to **Commander Edward Whitehead**, who has left the Association at the personal request for his services by Sir Stafford Cripps.

Obituary

Mr. E. B. Vignoles, M.I.E.E., a founder and past chairman of Evershed & Vignoles, Ltd., died at Streatley-on-Thames, Berks, on 10th November in his 84th year. He was the son of Hutton Vignoles, M.INST.C.E., and grandson of Charles B. Vignoles, a pioneer of railway engineering and inventor of the Vignoles rail. Educated at Malvern College and the Central Technical College, City and Guilds of London Institute, he joined the electrical firm of W. T. Goolden & Co. in 1889 as a pupil. Six years later when their instrument department became a separate company, he joined Sydney Evershed as a managing director and later secretary of the new firm Evershed & Vignoles, Ltd. He held these posts until his retirement in 1931, but continued as an active member of the board to within a few months of his death. When the new insulation testing set was developed in 1904, Mr. E. B. Vignoles coined the word "Megger," which was adopted as the registered trade mark of the company and which has since become known all over the world in electrical engineering circles. During his long service with the company he devoted his energies chiefly to the financial and policy side of the business. When he retired in 1931 he left England for a world tour visiting the company's agents. Mr. Vignoles was a past chairman of the British Electrical and Allied Industries Research Association.

The late
Mr. E. B. Vignoles

Mr. S. T. Allen.—The death occurred in a nursing home at Seaton (Devon) on 13th November in his seventy-sixth year of Mr. Sydney Trewhella Allen, M.I.E.E., who retired from the position of district manager in Central England to the C.E.B. in 1942. Mr. Allen was educated at Plymouth and Mannamead College and Cardiff University College, and was an articled pupil to S. E. Walker & Co., Cardiff. He was appointed representative in South Wales to Gilbert & Co., London, and electrical engineer to the Ebbw Vale Steel & Iron Co. He later became assistant borough electrical engineer at Plymouth and in 1908 became city electrical engineer at Carlisle. After serving as borough electrical engineer at Wolverhampton, he was appointed chief engineer and general manager to the West Midlands J.E.A. Mr. Allen was appointed Central England district manager to the C.E.B. in 1928. He was president of the I.M.E.A. in 1921-22, a past-chairman of the E.D.A. Council, and chairman of the South Midland Centre of the I.E E. from 1917-1919. He leaves a wife and one son.

The late
Mr. S. T. Allen

Mr. S. D. Barnwell.—The death occurred at Worthing on 8th November, at the age of sixty-five of Mr. Stephen Donald Barnwell, M.I.E.E. After spending his early days as junior assistant engineer at the Hampstead Corporation electricity works, Mr. Barnwell went to Buenos Aires as assistant electrical engineer to the Buenos Aires and Pacific Railway, with which he subsequently held the positions of power house superintendent and outdoor superintendent to the chief mechanical engineer. On returning to this country he became a director of Premier Garage (Worthing), Ltd.

Mr. W. M. Selvey.—The death occurred on 15th November at a nursing home of Mr. William Morrish Selvey, WH.SC., the well-known consulting engineer. Mr. Selvey was apprenticed at the Royal Dockyard, Devonport, and received his technical education at the Royal College of Science and the Central Technical College, and at the latter became personal assistant to Prof. Ayrton. He joined the staff of Merz & McLellan and remained with them as assistant engineer until 1913 when he set up in Sheffield on his own account as a consulting engineer. His principal business was that of advising local authorities with reference to matters arising out of the Electric Lighting Acts, purchasing a number of small companies run by authorized undertakers and incorporating them in larger local undertakings. This led to the establishment of several new local authority undertakings. Later he was associated with the Electricity Commissioners' Schemes under the 1919 and 1926 Acts.

The late
Mr. W. M. Selvey

He also built up a colliery practice, chiefly concerned with electrical equipment of coal mines in Yorkshire. His best-known work, however, was the development of precision testing of power plants. Other consulting work included the Govan destructor works at Glasgow and the design and layout of the completely new power system for Athens and district. Mr. Selvey was a founder member of the Institute of Fuel, of which he was president for 1941 and 1942. In addition to being a life Fellow of the Institute of Fuel, he was also a life member of the Institutions of Civil, Mechanical and Electrical

Engineers, the British Association of Refrigeration, and a member of the American Society of Mechanical Engineers. He practised in Sheffield for nine years before removing to Westminster. He was awarded a premium for a paper read before the I.E.E. in 1914-15 on "Power Plant Testing."

Mr. Matthew Pratt, managing director of Pratt Bros. (Edin.), Ltd., electrical engineers and contractors, Edinburgh, died on 31st October at the age of sixty-six. He was responsible for carrying out many large electrical installations in the Edinburgh area and throughout Scotland.

Mr. A. W. Money.—The death is reported of Mr. Alfred William Money, A.M.I.E.E., which occurred on 12th November at the age of eighty-one. Mr. Money retired from the position of borough electrical engineer of Brentford and Chiswick in 1940. He was for forty years with the late Chiswick Electricity Supply Co., Ltd.

Mr. J. E. Kingsbury.—In our reference to the funeral of Mr. J. E. Kingsbury last week we said that Col. Behn and General Harrison were present. We should have said that they were represented by Sir Frank Gill, who also attended on behalf of the Institution of Electrical Engineers.

Mr. W. O. J. Urry.—The death occurred on 10th November of Mr. W. O. J. Urry, director and secretary of Heenan & Froude, Ltd.

WILLS.—**Mr. R. B. Paul,** overseas manager of British Insulated Callender's Cables, Ltd., who died on 9th August, left personal estate in England and Scotland valued at £18,715.

Mr. J. B. Walker, of the East Midlands Electricity Board, who died on 3rd July, left £6,875 gross (£6,799 net).

Mr. W. H. Shipp, electrical engineer, West Wickham, who died on 1st September, left £19,584 gross (£17,202 net).

Waterworks Power Plant Practice

A PAPER on the economic considerations relating to waterworks power plant practice was presented by Mr. T. P. Wakeford (Metropolitan Water Board) before the Utilization Section of the I.E.E. in London last week. In order to compare the costs of steam, diesel and electrically operated pumping machinery, the author takes six typical waterworks loads outlining the duties of the plant with notes on the various kinds of machinery suitable.

There is an increasing use of electrical plant by the Metropolitan Water Board and where electricity is generated on site, except for peak lopping and standby, d.c. is always used, for ease of speed variation. The method of determining the capital charges, with diagrams showing the cost of pumping units, is indicated and subsequently the means of calculating the running expenses. An estimate of the annual charges is then set out in tabular form showing that on a long-term basis the electrical plant is cheaper. Appendices are included giving an estimate of the costs of a heat pump for a pumping station, but it is considered that for this purpose the simple coke-fired boiler is likely to be the most economic form of heating. Taking into consideration the power wasted by the rotor-resistance method of controlling the speed of an induction motor when driving a centrifugal pump, it is shown that the small saving in running costs hardly justifies the addition of expense of installing a commutator machine. In conclusion Mr. Wakeford emphasizes the need for stand-by generating plant to ensure continuity of the power supply in all circumstances. The generators may be used for peak lopping in the winter and the waste heat produced used for warming the buildings, the saving in cost of maximum demand charges generally paying for the capital cost of the generators.

Electrical Production in New Zealand

OUTPUT of household electrical equipment by New Zealand industries is developing favourably, although production of some lines is being hampered by shortage of materials. It had been hoped that the output of refrigerators would reach 10,000 and that of washing machines 15,000 units this year. Owing to the shortage of dollar funds and the difficulty in obtaining adequate raw materials, particularly sheet steel, it is unlikely, however, that these figures will be reached. In the case of washing machines, it is hoped to maintain a reduced production flow by the use of substitute metals, but it is now realized that local manufacturers cannot hope to meet more than approximately 80 per cent of the 1948 demand.

The production of domestic refrigerators fell somewhat in the course of this year, but arrangements have now been completed for the supply from sterling sources of components and the necessary steel pressings. Consequently, it is anticipated that local manufacturers will be in a position to meet the full 1949 demand as the existing plant capacity is quite adequate.

In addition, New Zealand factories are now capable of supplying domestic requirements of a considerable range of other household electrical appliances, including ranges, hot plates and cooking rings; towel rails; radiators and fires; toasters; jugs and kettles; irons (both standard and heat-controlled); water heaters; and vacuum cleaners. The vacuum cleaner industry is growing rapidly, with the total output in 1948 expected to reach 19,000 units, a figure which should meet approximately 50 per cent of local needs. The manufacture of other electrical appliances has been commenced in New Zealand and is expanding speedily.—*Reuter's Trade Services* (Wellington).

COMMERCE and INDUSTRY

Lighting and Fuel Economy. Responsibilities of Foremen.

COMMENTING upon the requirement that commercial undertakings are now asked to use not more than half their installed capacity of lighting, heating and electrical apparatus for six hours of the day, the General Electric Co., Ltd., points out that by converting a lighting installation from tungsten to fluorescent lamps giving a comparable amount of light, the new regulations can be met with no detriment to the brightness of the consumer's premises.

The company's lighting engineers have prepared the accompanying table in which the

Tungsten		Fluorescent		
Watts	Lumens	Rating	Actual Watts*	Lumens
15	107	—	—	—
25	195	—	—	—
40	312	Two 1¼-ft, 15 W†	42	840
60	550	One 3-ft, 30 W	42	1,260
75	740	Two 2-ft, 20 W†	52	1,240
100	1,094	One 4-ft, 40 W	52	1,720
150	1,855	Two 2-ft, 40 W†	100	2,320
200	2,572	One 5-ft, 80 W	100	3,040

* Including power loss in choke. † Lamps in series.

power consumption and light output from various ratings of tungsten and fluorescent lamps are compared. The comparisons are made with the British Standard figures for tungsten lamp efficiencies.

Status of the Foreman

Under the auspices of the Birmingham Central Technical College a group of senior executives in the Midlands has recently concluded the drafting of a code of management practice relating to the status of the foreman in industry. The executives concerned have responsibilities in the control of widely varying branches of industry. The chairman is Mr. J. L. Green (Stourbridge Rolling Mills, Ltd.), the secretary Mr. G E. Bartlett (Tube Investments (Group Services), Ltd.), and among the members is Mr. A. F. Davis (works manager, Simplex Electric Co., Ltd.).

As a result of their studies the group has produced suggestions which have been published by the Industrial Administration Group of the Students' Union of the Birmingham Central Technical College on behalf of its members and the members of the Institute of Industrial Supervisors. The study draws particular attention to changes in industrial organization by the increasing use of functional specialists and to the effect of this trend upon the tasks and qualities of foremen and supervisors. Attention is drawn to selection and training of foremen and the importance of the human qualities involved.

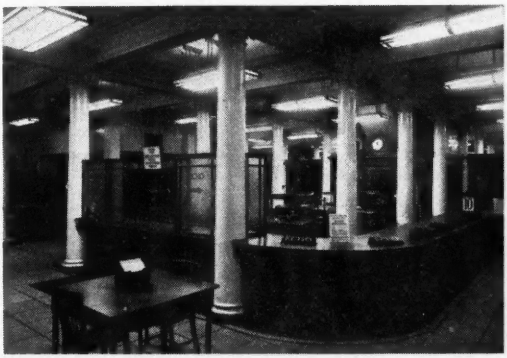
Copies are obtainable at 2s. each from the hon. secretary, Industrial Administration Group, Birmingham Central Technical College, Suffolk Street, Birmingham.

Belfast Lighting Course

The first Illumination Design Course organized by the Lighting Service Bureau in Northern Ireland, will be held at the Central Hall, College of Technology, Belfast, on 30th November and 1st December. The speakers will be Mr. W. Robinson, Mr. C. J. King and Mr. A. D. S. Atkinson, and the subjects will include light and vision, design, electric lamps, industrial lighting, applications other than industrial, application of fluorescent lamps and economics of lighting installations.

Newspaper Office Lighting

The accompanying picture shows "Metrovick" fluorescent lighting at the offices of the *Liverpool Daily Post and Echo*. Special care was taken by the Metrovick illuminating engineers in preparing their proposals to make sure that the new lighting would maintain, and if possible enhance, the architectural character of the building. The four main units each containing four 80-W 5-ft "warm-white" lamps are finished in bronze with panels of obscured reeded glass. In addition twenty-nine two-lamp units of similar construction and finish



Metropolitan-Vickers fluorescent lighting in a Liverpool newspaper office

are used at the sides of the main office and in other offices. Auxiliary gear is incorporated in each fitting. The level of illumination in service is 30 lumens per sq ft. The installation was carried out by the electrical staff of the newspaper.

Historic Crompton Collection

As a permanent record of the early work of Col. R. E. B. Crompton and his associates, Crompton Parkinson, Ltd., have completed an historic collection of machines, instruments, arc lamps and other apparatus, together with designs and photographs, at their Chelmsford works.

Part of the Crompton collection at Chelmsford

Among the items in the collection are a Crompton arc lamp (1878), a Crompton-Burgin generator (1879), a Crompton generator with wrought-iron magnets (1883), an accumulator with sixty-one plates (1886), early a.c. machines, and measuring instruments.

Removal of Controls

Following the announcement of the Government's decision to remove controls upon production of many classes of goods the Ministry of Supply has given further details. The necessity for licences for the production of radio receivers and radiograms has been revoked. Altogether seventy-five products controlled by the Machinery, Plant and Appliances Orders are removed from the scope of the Order. These include many kinds of machinery for various industries normally driven by electric motors. Directly electrical items are electrical machinery and plant, electro-plating machinery, electric lamp-making machinery, and accumulators. Among the items which remain under control is refrigeration plant, domestic, commercial and industrial. The Electrical Appliances Orders have been reviewed and the Minister of Supply has approved the issue of open licences for all the products covered with the exception of space and water heaters. These were excepted at the request of the Ministry of Fuel and Power.

Housing and Town Planning Exhibition

Several electrical appliances were to be seen among the displays at the International Housing and Town Planning Exhibition held at Olympia, London. One of the most interesting of these exhibits was a new 3-kW electric water heater shown by Hotentot Industries, which will give a continuous flow of boiling water within 25 seconds at a rate of 1 pint in 75 seconds: a good flow of hot water at 130 deg F is available within 10 seconds. Washing machines were shown by both Thor Appliances ("Automagic") and H. Fisher (Oldham), who also had on view water heaters and drying cabinets. Other appliances displayed included the "Genwind" paint spraying plant (International Marketers, London), the "H.B.E." auto time control (Horstmann Gear Co.), vacuum cleaners and washing machines (Hoover) and various refrigerators and television sets.

Electrical Aids for Schools

A small exhibition of electrical equipment specially designed for schools has been held at London County Hall this week. The equipment included a broadcast receiver designed by the L.C.C.'s chief engineer to give schools the best possible reception of school broadcasts. Loudspeakers such as are in use in school classrooms were fitted in a neighbouring corridor and room to demonstrate the receiver. There was also an installation which gives from ordinary electricity mains a supply of low-voltage a.c. or d.c. suitable for experimental work in secondary schools. Other experiments showed the uses to which the low-voltage installation might be applied.

Visit to Dagenham Works

For the first time since the war, transport managers from Birmingham recently visited the Dagenite works of Peto & Radford at Dagenham as guests of Holsun Batteries, Ltd. (Dagenite sales concessionaires). The transport managers were welcomed on arrival in London and taken by coach to the works. After lunch in the works canteen they were shown over the factory and follo wing tea they had the opportunity of

interrogating the company's technicians about the manufacture and use of Dagenite batteries. Mr. H. F. Banks, of the Accumulator Service Co., Handsworth, near Birmingham, on behalf of the visitors thanked the company for its hospitality. The transport managers then returned to London where they were entertained by the company.

Export Packing Works

On 10th November, Mr. E. A. Carpenter, president of the Manchester Chamber of Commerce, opened a new export packing works established by Beck & Pollitzer, Ltd., at the Trafford Park Trading Estate. He and the other guests were welcomed by Mr. G. E. P. Pollitzer. The works has a first-class case-making shop and heavy overhead lifting facilities and it is claimed that each job is a " made-to-measure " fit. A brochure produced for the occasion showed a number of examples of the class of work carried out.

The company has recently registered Beck & Pollitzer (Africa), Pty., Ltd., with head office at 3, Yorkshire House, Corner Marshall and Rissik Streets, Johannesburg. The new company acts as shipping, clearing and forwarding agents, and marine and general insurance agents, specializes in the handling of heavy plant and machinery.

Large Expanded Metal Resistance

One of the largest metallic loading resistances ever made has just been completed by the Expanded Metal Co., Ltd., Stranton Works, West Hartlepool. It is designed for the testing of heavy duty railway traction equipment and is to be exported to an important engineering concern on the Continent. It can handle a maximum load of 25,000 h.p. with current adjustment between 25 A and 11,000 A in 25-A steps, at pressures up to 3,300 V. The greater part of this resistance is continuously rated although a small portion is intended for intermittent duty only. The complete unit, which does not include switchgear, comprises fifty frames of resistance banks, occupying 6,000 cu ft of space, and requiring ventilating air at approximately 160,000 cu ft per min.

The British Railway Executive is providing special trucks to transport this resistance via the train ferry direct from the manufacturers' siding to that of the customer.

Indian Duty on Batteries

Accepting the Indian Tariff Board's recommendation for the protection of the motor vehicle battery industry in India, the Government of India has notified the imposition of a protective duty of 80 per cent *ad valorem* on imports of motor vehicle batteries and plates from the United Kingdom. The duties are to remain in force for a period of three years. The present demand for motor vehicle batteries in India is estimated at 250,000 a year and the estimated productive capacity of the Indian industry is 268,300 batteries for 1948 and 352,300 for 1949.—*Reuter* (New Delhi).

Scottish Closed-Cycle Gas Turbine

Several references have been made in the *Electrical Review* to the 12,500-kW closed-cycle gas turbine being built by John Brown & Co., Ltd., of Clydebank, for the North of Scotland Hydro-Electric Board. Reporting Dr. James M. McNeill's presidential address to the Institution of Engineers and Shipbuilders in our issue of 15th October, we inadvertently referred to this turbine as of the open-cycle type. Technical particulars of the closed-cycle design were given by us on 7th May.

World Power Resources

Subsequently to the issue of the Statistical Year-Book of the World Power Conference (No. 4) which was reviewed in the *Electrical Review* of 15th October, the Executive Board of the United Nations Educational, Scientific and Cultural Organization (UNESCO) made a generous contribution towards the cost of producing this Year-Book. In doing so UNESCO has been mindful of the importance of the Year-Book in connection with the Conference on the Conservation and Utilization of Resources to be convened by the Economic and Social Council of the United Nations in 1949. The World Power Conference, which has consultative status with the Council, will assist the preparatory committee set up by the latter body.

F.B.I. Register

The 1948-49 edition of the " F.B.I. Register of Manufacturers " has just been published jointly by Kelly's Directories, Ltd., and Iliffe & Sons, Ltd. The only complete guide to members of the Federation of British Industries, their products and services, this latest edition totals nearly 1,000 pages and includes up-to-date details of many hundreds of new F.B.I. members. It lists nearly 6,000 firms and their products and includes much information of interest to overseas buyers.

The products and services section contains more than 5,000 product headings facilitating the rapid identification of supply sources. The address section gives complete information on every member, and the brands and trade marks sections indicate the makes of branded products. There are reference facilities in French and Spanish, while the classification has been improved and greatly extended.

The Register is produced under an arrangement with the Federation of British Industries, and Sir Frederick Bain, president of the F.B.I., contributes a foreword. Home orders for the Register should be sent to Kelly's Directories, Ltd., 186, Strand, London, W.C.2, and overseas

orders should be addressed to Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. The price is 42s., home and overseas, with special terms to F.B.I. members.

Post Office Engineers' Wages

At a conference at Morecambe on Saturday last, branch chairmen and secretaries of the Post Office Engineering Union were informed by Mr. D. J. W. Coward, the general secretary, that a wages offer giving increases to members ranging from 2s. to 7s. a week had been made. The union had claimed minimum advances of 7s. to approximately £1 a week, according to grade and age. The conference expressed concern at the inadequacy of the offer which, it was stated, left many skilled men on rates which were below a reasonable standard of subsistence, and the executive council was urged to make representations to the Post Office for substantial improvements.

"Lighting Service"

The Autumn issue of "Lighting Service," issued by the Lighting Service Bureau, contains, in addition to other matters relating to lighting, well-illustrated articles on the recent "Darkness into Daylight" Exhibition, and some impressions of Mr. A. D. S. Atkinson of the lighting in Paris during the meeting of the International Commission on Illumination last summer.

Advertisement Correction

Watford Instruments ask us to say that the name of the instrument advertised by them in our last issue (p. 75) was incorrectly spelt. It is the "Model 'B' Strobolyser."

South African Import Prohibitions

A *Reuter's Trade Services* message from Capetown gives a list of goods the importation of which is prohibited by the South African Government. The list includes electric razors, electric percolators, toasters and waffle irons, radiograms of a f.o.b. cost exceeding £25 sterling, and radio receiving sets of a f.o.b. cost exceeding £15 sterling.

Trade Announcements

Woods of Colchester, Ltd., announce that from 2nd December next, their London office will be at Fenwick House, 292, High Holborn, W.C.1 (telephones: Chancery 8284 and Holborn 1381).

Electrical & General Accessories (Leicester), Ltd., informs us that its head office and works are now at Holyhead Road, Wednesbury, Staffs. (telephone: Wednesbury 0911-5; telegrams: "Elgenic, Wednesbury").

A.B. Metal Products, Ltd., informs us that it is opening a factory for the manufacture of its products in Canada. The Canadian factory will be a fully owned subsidiary of the company. Its location has not yet been finally settled, but negotiations are in hand. Mr. L. G. Bray, formerly of C. H. Parsons, Birmingham, has left Luxor Metal & Plastics, Ltd., and has joined the staff of A.B. Metal Products, Ltd., as works manager.

Sidney G. Jones, Ltd., 8, Balham Hill, London, S.W.12, announces that it is the sole agent in this country for the new "M.S.A." engraving machine manufactured by Micromécanique of Switzerland.

To give improved service and quicker delivery from stock in the Kent and East Sussex areas, **Johnson & Phillips, Ltd.,** have opened a new depot at Kensington Street, Tunbridge Wells (telephone: Tunbridge Wells 90) where large stocks of J. & P. cable and British National domestic appliances will be maintained.

To succeed the late Mr. R. B. Whittick, A.M.I.E.E., **G. P. Dennis, Ltd.,** have appointed Mr. W. O. Jackson, ASSOCIATE I.E.E., as technical representative for London and the Southern Counties. A new London office is to be opened shortly by the company; meanwhile correspondence and matters of urgency should be sent either to the works at Liverpool or to Mr. Jackson at 54, Monk's Avenue, New Barnet, Herts. (Barnet 4578).

Sciaky Electric Welding Machines, Ltd., has appointed Mr. R. Bushell, M.INST.W., as technical sales representative for the North of England; until recently he was Midlands sales representative. The Manchester office is at 147, Woodhouse Lane East, Timperley, Cheshire, where spares are held in stock.

Trade Publications

W. Canning & Co., Ltd., Great Hampton Street, Birmingham, 18.—Illustrated catalogue of fully automatic electroplating plants.

The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Priced folder on fluorescent and gas-filled lamps.

Linolite, Ltd., 158, Bishopsgate, London, E.C.2.—Leaflet and price list on decorative wall fittings for tubular lamps.

The British Thermostat Co., Ltd., Sunbury-on-Thames, Middlesex.—Technical leaflet describing the "OZ" indicating temperature controller.

Diamond Motors (Wolverhampton), Ltd., Upper Villiers Street, Wolverhampton.—Illustrated leaflet giving details of a pedestrian controlled electric vehicle suitable for ice cream vendors.

British Oil Engines (Export), Ltd., Loughborough.—Illustrated catalogue of Petter "Superscavenge" diesel engines.

Change of Name

The Belgrave Engineering Co., Birmingham, has changed its name to Moseley Engineering Co.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

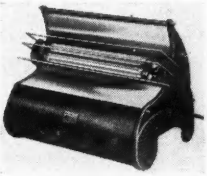
Portable Washing Machine

A SMALL portable washing machine which can be heated on a hot-plate, fire, etc., is being marketed by C. J. CALLENDER & Co., Bank Parade, Raynes Park, London, S.W.20. Comprising a heavy-gauge aluminium container, 16 in. high and 14 in. in diameter, this "Lewker" machine incorporates in the removable top a $\frac{1}{16}$-h.p. B.T.H. shaded-pole motor, the spindle of which automatically connects up with a conventional type of agitator operating through 40 deg. It is possible to wash thoroughly 3 lb of clothing in 15 min. By using the machine on a hot-plate and so maintaining the temperature of the water greater efficiency is obtained.

"Lewker" washing machine

Portable Fires

Two new "Clem" electric fires are introduced by CLAYTON, LEWIS & MILLER, LTD., Manilla Road, Southend-on-Sea. The 2-kW "Classic" model has a sturdy aluminium frame giving lightness with easy portability. The two 11-in. elements, which are fitted in a parabolic reflector, can be supplied encased in silica tubes. Finishes available are cream, blue, beige and green. The other fire, the 1-kW "Astor," which has an adaptable swivel design reflector, has a die-cast frame, spray painted with hard-finish gloss enamel.



"Clem Classic" fire

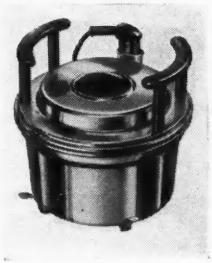
Table Cooker

Roasting, grilling, steaming and baking are all possible with the new "Elecooker" radiant heat table cooker made by the CHAMPION ELECTRIC CORPORATION, Champion Works, Seaford, Sussex, primarily for use in the bed-sitting room and small flat.

The 500-W element is in the lid and though it takes somewhat longer than by the usual methods, there is practically no risk of burning food by overcooking. The use of a close-fitting lid practically eliminates cooking odours.

The cover is fitted with two curved heat-insulated handles which form a convenient rack for warming plates, and water can be heated by inverting the cover upon its handles and standing the filled container upon it. There is a circular "Pyrex" glass inspection window through which the progress of the cooking can be watched. The container, a plain aluminium pressing polished outside and with no attachments, is particularly easy to keep clean.

An alternative shallow container for quick grilling or frying is available, and a three-compartment tray for cooking vegetables or other accessories above the meat.



Champion "Elecooker"

Vacuum Cleaner

THORN ELECTRICAL INDUSTRIES, LTD., 105-109, Judd Street, London, W.C.1, announce that the "Mary Ann Bedalax" cleaner is now in production and prompt delivery can be made.

Improved Hair Dryer

CHARLES ALEXANDER & Co., LTD., 74, Portsmouth Road, Surbiton, state that their "Magicflow" hair dryer is now manufactured with a universal motor.

Mixer

An electric mixer for drinks and other light liquids, made by the LUTREV MANUFACTURING CO., LTD., 17, Streatham Hill, London, S.W.2, has been designed not only to present an attractive appearance, but to be hygienic and practical in use. The motor is of the shaded-pole induction type robustly constructed to ensure trouble-free running. All bright parts, including the mixing jug, are of anodized aluminium, thus overcoming the effects some foods

Lutrev mixer

have on untreated aluminium containers. Each mixer is supplied with two mixing agitators, and 6 ft of three-core water- and grease-resisting flex.

Coffee Percolator

The new "Gee" electric coffee percolator supplied by POLLARD, RAY & SAMPSON, LTD.,

"Gee" coffee percolator

333, Rayners Lane, Pinner, is constructed of heavy-gauge copper, chromium plated. It has a capacity of 1½ pints, percolation being visible through the glass top. All removable parts are easily cleaned, and four anti-tip base knobs provide heat insulation.

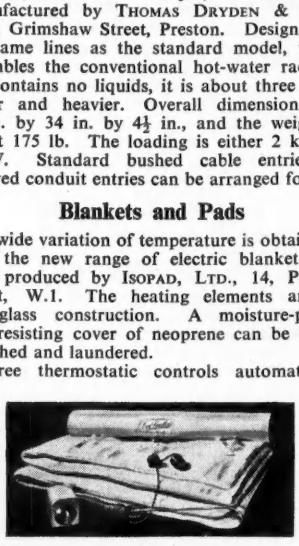
Radiator

A larger model of the "Drydenair" electric radiator, called the "Major," is now being manufactured by THOMAS DRYDEN & SONS, LTD., Grimshaw Street, Preston. Designed on the same lines as the standard model, which resembles the conventional hot-water radiator but contains no liquids, it is about three times larger and heavier. Overall dimensions are 28 in. by 34 in. by 4½ in., and the weight is about 175 lb. The loading is either 2 kW or 3 kW. Standard bushed cable entries or screwed conduit entries can be arranged for.

Blankets and Pads

A wide variation of temperature is obtainable with the new range of electric blankets and pads produced by ISOPAD, LTD., 14, Poland Street, W.1. The heating elements are of fibre-glass construction. A moisture-proof, heat-resisting cover of neoprene can be easily detached and laundered.

Three thermostatic controls automatically



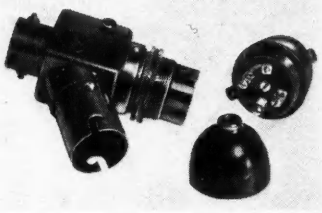
"Isoblanket" fitted with bedside heat control

regulate the maximum temperature of the "Isoblanket" and a bedside heat regulator permits the user to select any desired temperature up to 140 deg F. The maximum loading of the "Isoblanket" is 190 W, but a comfortable heat is obtainable with only 40 W. The average consumption is well under one kWh per night.

Three "Isopads" are available. In the "Twinheat" and its smaller edition the "Midget" there is a temperature variance of approximately 20 deg F between the two sides of the pad, a thermostat controlling the heat on the hotter side to 140 deg F. Six different heats from 90 to 155 deg F, three on each side, are obtainable with the third model which is fitted with a three-heat switch. The loading of the pads is 10-24 W.

Adaptors and Suspension Switches

Two new electrical installation accessories have been introduced by the AGRO ELECTRICAL CO., LTD., 42, Buckingham Street, Aylesbury. One is a heat and light adaptor of more or less conventional appearance, the other a suspension



Agro adaptor and suspension switch

switch available either in brown or white bakelite.

Portable Wood Router

An interesting feature of a portable high-speed wood router manufactured by SCOPHONY, LTD., Wells, Somerset, is that it incorporates a three-phase, 200-V, 400-c/s, squirrel-cage induc-

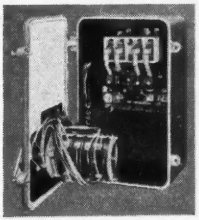
Scophony high-speed wood router

tion motor which rotates the cutting tool at 20,000 r.p.m. and develops ½ b.h.p. This machine was principally designed for routing the wooden rollers used in the manufacture of wall-paper, but it can easily be adapted for use in any wood-working shop. The motor is furnished with a cooling fan which provides a jet of air to remove wood chips from the work. A further refinement is in the form of two readily accessible lamps which are fitted into the nose of the router to illuminate the working area.

Motor Control Gear

A range of contactor-break star-delta starters designed for 400/440-V, three-phase motors of up to 20 h.p. has recently been introduced by BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester. These "YH" starters are of

the rotary switch type operating in conjunction with the "on" button. With the switch in the "start" position, the "on" button is pressed to close the main contactor. The motor is then allowed to accelerate up to full speed when the switch is moved to the "run" position and the button is released. The mechanism is such that the starting operation can only be carried out in correct sequence. To "inch,"



Brookhirst type "YH" star-delta starter

the button is pressed with the switch in the "start" position. The dustproof enclosures for these starters are fabricated from cast aluminium, provided with a hinged front cover and intended for wall fixing.

Switchboard Instruments

A recent addition to the products of CROMPTON PARKINSON, LTD., Astor House, Aldwych, London, W.C.2, is in the form of a range of 6-in. dial moving coil switchboard instruments which are available in two patterns for d.c. or a.c., and in two types for projecting or flush mounting.

An interesting feature of these instruments is the improved design of self-shielding magnet system, incorporating two anisotropic magnets, which enables a high torque characteristic to be obtained without using a large number of milliampere turns on the winding.

They are individually calibrated to B.S. first grade accuracy. For ranges up to and including 0-100 A d.c. ammeters have self-contained shunts. Voltmeters can be supplied to suit customers' requirements, but they are normally adjusted to give full-scale deflection at 15 mA. For a.c. measurements moving coil rectifier type voltmeters are available for any range of not less than 0-3 V, together with milliammeters giving full-scale indications of 0-1, 5, 10 or 50 mA.

If so desired, projecting or flush type instruments can be provided with all-glass fronts and dials for educational and demonstration purposes.

Vacuum Protective Equipment

Several instruments for vacuum and other installations, which have not hitherto been available in this country, are now being manufactured by W. EDWARDS & CO. (LONDON), LTD., Kangley Bridge Road, Lower Sydenham, London, S.E.26. The first of these is vacuum switch type V.S.1, which is primarily intended as a safety device for vacuum plant employing high-voltage electrical equipment and as such can be arranged to break the electrical circuit if the desired vacuum is not attained. It can also be employed on low-pressure systems which are required to be automatically switched at pre-set gas pressures between 15 and 500 mm. Hg. "Flowtrol" units have also been designed for the protection of water-cooled equipment by switching off the power supply, sounding alarms, etc., when the water flow is inadequate or fails. These units can be used with other liquids of suitable viscosity such as engine fuel and lubricating oil. A range of fine-control needle valves is also available.

Voltage Tester and Screwdriver

A handy voltage indicator of the neon tube type, the "Neolec Maintest," is offered by NEO ELECTRICAL INDUSTRIES, LTD., 87, Corporation Street, Manchester, 4. It is suitable for 100 to 700 V and is fashioned like a propelling pencil, having a similar pocket clip, while the contact point is made of hardened and tempered silver steel to serve also as a screwdriver. The capacity glow of the neon tube is visible through an oval window in the barrel, which is machined from a solid piece of ebonite rod. The indicator weighs 1½ oz and is 4¾ in. long overall.

Refrigeration Equipment

"Coldstor" products manufactured by MCCALL & PARKER, LTD., Langhedge Lane, Edmonton, London, N.18, now include a 3-cu ft domestic refrigerator, dual-purpose storage cabinets accommodating both ice-cream and frozen foods, and a range of service cabinets. The domestic refrigerator is arranged with the compressor unit alongside the storage compartment with a drawer above, the white vitreous

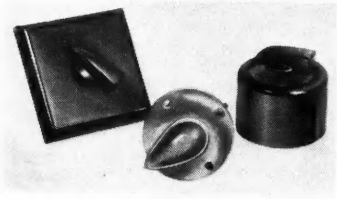
"Coldstor" table-top refrigerator

enamel top over the whole providing a useful work table. No more floor space is therefore required than for a normal kitchen table.

Rotary Switches

A comprehensive range of rotary switches from 5 to 13 A, surface or wall mounting, is

now being made by CRATER PRODUCTS, LTD., The Lye, St. John's, Woking. Types are available for fitting, without alteration, into the standard conduit switch box, to control a number of



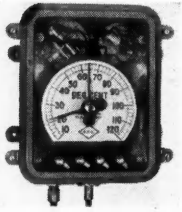
Selection of Crater rotary switches

lighting circuits, thus saving wiring and installation time, space and the necessity for fitting two or more conduit switch boxes, etc. The cost of the switch is about the same as that of two toggle switches.

Indicating Temperature Controller

An instrument for controlling the oil temperature in large power transformers, which has been designed specifically to meet the requirements of the relevant B.E.A. specification, is now being made by the ACCURATE RECORDING INSTRUMENT CO., Aric Works, Garth Road, Lower Morden, Surrey.

The temperature-sensitive element employed is the "Aric" liquid expansion thermometer. A full 270 deg scale on a 6-in. diameter dial is provided for temperature indication, and a bold re-set maximum indicator is fitted on all standard models. The mercury switches are



A.R.I.C. indicating temperature controller

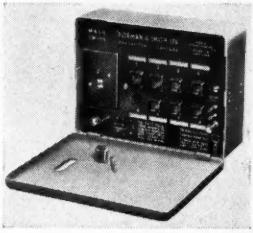
easily set to the openly divided scales, the second one being provided with an additional scale for setting the differential.

Unusual Distribution Box

A distribution box that is distinctive in respect of the type and arrangement of the sub-circuit fuses is being made for the average dwelling house by DORMAN & SMITH, LTD., Ordsal Works, Salford, Manchester, 5.

The main double-pole switch of 60 A at 240 V has a plain on-off indicator, which is visible through the handle slot in the hinged lid of the box. The single-pole fuse-board with neutral busbar provides eight ways, two of 30 A for the cooker and water heater and six of 13 A for lighting and small power circuits. The busbar is mounted at the back of the panel in a way that prevents accidental contact with "live" metal during removal of fuses. The latter belong to the DS "fused pin" cartridge range with a rupturing capacity of 25 MVA at 440 V.

A novel feature is a rotary switch with test lamp, built into the lower left-hand portion of the front panel. The switch knob is turned until the lamp glows, when the switch-stud number will correspond with the "blown" fuse-holder number. The fuse is replaced by simply unscrewing the cartridge with finger and thumb, pressing in a spare and screwing the holder home again. Further rotation of the switch to the next "live" notch will provide light for fuse renewal in the dark, the lamp being extinguished by closure of the box lid. The pressed metal box has knockouts at top

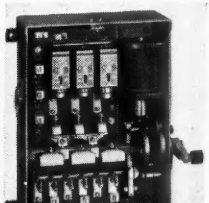


Dorman h.r.c. house distribution box

and bottom for conduit and an open back for back-outlet wiring. It weighs 2 lb 10 oz, measures 8⅛ by 6¼ by 3⅛ in. and is cream stove enamelled.

Star-Delta Starters

It is announced that manually operated star-delta starters with a maximum current rating of 25 A for induction motors of between 1 and 15 h.p. have been added to the "Elstree" range of control gear manufactured by KENBAR ELECTRICAL CO., LTD., Manor Way, Elstree, Herts. They are fitted with a correct sequence switching device, a prominent stop button, a silent low-voltage release and three self-resetting adjustable magnetic overload releases each of which is furnished with variable oil dash-pot time lag. Linked terminals are also provided to facilitate remote



Kenbar star-delta starter

tripping by means of a normally closed push-button switch. These starters are totally enclosed in stout sheet-steel casings with cast front covers.

Employment Changes

TURNOVER OF LABOUR : HOURS OF WORK : AVERAGE EARNINGS

FOR the first time figures are published in the *Ministry of Labour Gazette* (October) showing the labour turnover in the chief manufacturing industries. Based on employment returns, the numbers of engagements and discharges or other losses during the four weeks ended 24th July last are tabulated for different industries. Administrative, technical and clerical employees are included as well as operatives, but persons who were taken on and who left during the period are excluded. The overall figure of engagements was 2·3 (men 2·0, women 3·0) and the percentage of losses 2·5 (men 2·0, women 3·5). In some industries the figures represent an annual turnover rate of more than 50 per cent and in others below 10 per cent.

TABLE I.—TURNOVER OF LABOUR PER 100 EMPLOYEES DURING FOUR WEEKS ENDED 24TH JULY, 1948

Industry	Engagements			Losses		
	M	W	T	M	W	T
Electrical machinery ..	2·0	2·7	2·2	1·8	3·8	2·3
Wires and cables ..	1·3	1·9	1·5	1·9	3·5	2·5
Telegraph and telephone apparatus	1·4	3·1	2·0	1·8	3·4	2·4
Radio apparatus ..	1·9	2·6	2·2	2·7	5·9	4·1
Valves and lamps ..	1·7	3·0	2·4	2·8	4·8	3·9
Batteries & accumulators	2·1	4·3	3·0	2·8	5·2	3·8
Other electrical goods ..	2·2	3·1	2·6	3·2	5·0	3·9

M, men; W, women; T, total.

Table II sets out the average earnings and hours of work in different industries in April, 1948, and gives percentage increases in earnings over October, 1938. The amounts are the actual earnings in the weeks specified, inclusive of overtime, etc., and in view of the wide variations between different industries in the proportions of skilled and unskilled workers and opportunities for extra earnings the figures should not be taken as indicating disparities in the prevailing rates of wages. The overall increase in earnings of 114 per cent compares with an estimated increase of 67-68 per cent in actual rates of wages, exclusive of overtime. The difference is accounted for by such factors as increase in overtime, increase in payment by results, and changes in the proportion of the sexes, etc. Women part-time workers are included on the basis of two equalling one full-time worker.

The usual monthly analysis is given of the number of insured persons employed in various industries in August (only classes of workers covered before the introduction of the National Insurance Scheme are included). In electrical engineering the number of employees increased to 162,100 in August from 161,300 in July and 154,300 in mid-1947. There was also an increase in those employed in the electrical wiring and contracting industry, the August number being 63,300 against 62,500 in July and 57,900 in mid-1947. In both industries

TABLE II.—HOURS WORKED AND AVERAGE EARNINGS

Industry	No. Covered by Return	Av. Earnings in Last Pay-Week in April	Av. Hours Worked	Av. Hourly Earnings	Av. % Increase in Weekly Earnings over Oct., 1938	Av. % Increase in Hourly Earnings
		s. d.		d.		
Electrical Engineering:						
Men	77,504	138 7	45·1	36·9	86	104
Youths	10,412	46 11	43·0	13·1	90	105
Women	32,000	76 3	41·9	21·8	135	152
Girls	1,989	45 7	41·6	13·1	136	156
All Workers ..	122,898	112 10	44·0	30·8	122	140
Electrical Apparatus, Cable, Lamps, etc.:						
Men	75,045	136 4	45·9	35·6	87	104
Youths	5,572	51 0	42·9	14·3	66	84
Women	56,293	75 11	41·8	21·8	113	130
Girls	4,605	47 7	42·2	13·5	128	147
All Workers ..	140,915	106 4	44·0	29·0	112	130
Electrical Wiring and Contracting:						
Men	6,266	137 10	47·6	34·7	74	81
Youths	2,750	43 5	45·2	11·5	106	116
Women and Girls ..	142	—	—	—	—	—
All Workers ..	9,158	108 5	46·7	27·9	91	99
Electricity Supply:						
Men	78,188	128 3	46·4	33·2	77	88
Youths	4,492	49 8	45·9	13·0	89	102
Women	1,440	74 1	40·5	22·1	—	—
Girls	22	—	—	—	—	—
All Workers ..	84,142	123 2	46·2	32·0	79	90

the number of women and girls employed was the same in July and August. A decrease in employment in the manufacture of electrical apparatus, cables, lamps, etc., to 268,100 in August from 268,400 in July and 276,200 in mid-1947 was caused by a reduction in women workers (August 121,300, July 121,900 and mid-1947, 133,200).

At 13th September unemployed persons in the electrical machinery section (Great Britain) numbered 1,509 (including 418 women); in the electric wire and cable group 714 (299); telegraph and telephone apparatus 339 (153); radio apparatus (excluding valves) and gramophones 1,299 (596); radio valves and electric lamps 315 (144); batteries and accumulators 270 (116); other electrical goods 1,889 (903); electrical wiring and contracting 1,530 (52).

During the four weeks to 1st September, among undermanned industries 707 persons (including 123 women) were placed in employment in the production of generating plant for electricity undertakings; this compares with 420 (47 women) in the preceding four weeks. The number of placings on power station construction was 822 against 306 and on Scottish hydro-electric schemes 1,136 compared with 828.

FINANCIAL SECTION

Company News
Stock Exchange Activities

Reports and Dividends

The Calcutta Tramways Co., Ltd., reports receipts for 1947 of £803,807, as compared with £1,130,647 for 1946, and expenditure of £837,664 (against £748,898), leaving a deficit of £33,857 (against a credit balance of £381,749). After providing for London expenses, renewals, replacements, debenture service, preference dividend, etc., there is a total deficit of £151,179, as compared with a credit balance in the preceding year of £50,725. The balance brought in is £59,018, and after adding sums from other sources a credit balance of £45,444 is carried forward.

In his statement, Sir Geoffrey R. Clarke (chairman) says that since 1st January last traffic receipts have shown a satisfactory increase and it is estimated that, after paying all expenses, profits are now being earned sufficient to meet the service of debentures, the preference dividend, and provide a reasonable dividend on the ordinary capital, which, however, cannot be ascertained until the final result for 1948 is known.

Tube Investments, Ltd., reports that the aggregate trading profits of the subsidiaries for the year ended 31st July last were £5,042,521, after providing £1,126,513 for depreciation and the increased replacement costs of fixed assets, but before profits tax and income tax. For 1946-47 the trading profits were £4,229,055, after providing for depreciation and E.P.T. for five months, but before special depreciation of £500,000 and profits tax and income tax. It is proposed to pay a final dividend on the ordinary stock of 12½ per cent (same), making 25 per cent for the year, and at the same rate relatively on the liaison ordinary shares. The same total was paid for 1946-47.

British Aluminium Co., Ltd.—The subscription list opened and closed on Wednesday last of an offer for sale of £1,500,000 3 per cent mortgage debenture stock at £95 per cent, 1952-88. Repayment may be made at 102½ per cent from 1st July, 1952, to 30th June, 1957, at 102 up to 1962, at 101½ up to 1967 and at 101 thereafter, the final redemption date being 1988. Proceeds of the issue, estimated at £1,383,375, will be used for financing extensions now being carried out at the company's Falkirk rolling mills and for the re-equipment of its reduction works.

The Electrolytic Zinc Co. of Australasia, reports a gross working profit for the year to 30th June last of £1,336,489, as compared with £1,536,843 for the preceding year, and a net profit of £516,842 (against £627,093). The total dividends on the preference and ordinary capital is 15 per cent (against 17½ per cent) and £219,364 is carried forward (against £216,985 brought in).

The Hackbridge & Hewittic Electric Co., Ltd., has declared an interim dividend of 4 per cent (unchanged).

J. Stone & Co., Ltd., are again paying an interim dividend of 10 per cent.

The British Electric Resistance Co., Ltd., which paid no dividend for 1946-47, has announced a final dividend of 15 per cent making 20 per cent for the past year.

The Broadcast Relay Service, Ltd., has declared an unchanged interim dividend of 8 per cent tax free.

Johnson & Phillips, Ltd., are paying an interim dividend of 7½ per cent, the same as for a number of years past.

Ward & Goldstone, Ltd., have declared an interim dividend of 20 per cent (unchanged).

New Companies

Arger Trading Co., Ltd.—Private company. Registered 6th November. Capital, £5,000. Agents for the import, export, purchase and sale of electrical components, apparatus and equipment, etc. Directors: E. F. Mills and Joan H. Mills. Solicitors: Blyth Dutton & Co., 112, Gresham House, E.C.2.

Proteon Lux, Ltd.—Registered 3rd November. Capital, £1,000. Merchants, manufacturers of

electrical and luminous discharge apparatus, glass blowers, electrical contractors, manufacturers of, and dealers in, electrical apparatus and appliances, etc. Subscribers: H. Wood and L. G. James. Regd. office: 16, Cape Street, Birmingham. Solicitors: Stoddard Taylor & Co., Birmingham.

R. S. Meredith, Ltd.—Registered 28th October. Capital, £3,000. Radio, television and electrical engineers and contractors, etc. Directors: A. E. Dunn, V. A. Dunn and Mrs. Deborah Dunn. Regd. office: 7, Ferme Park Road, Stroud Green, N.4.

Kingston & Wall, Ltd.—Registered 30th October. Capital, £1,000. Electric lighting, heating, wireless, television, mechanical and general engineers and engineering contractors, etc. Directors: D. H. Kingston and H. V. Wall. Regd. office: 383, Soho Road, Handsworth, Birmingham, 21.

Arthur & A. Cummins, Ltd.—Registered 29th October. Capital, £3,000. To acquire the business of an electrical engineer and contractor carried on by A. Cummins at 4, Corporation Street. Directors: A. Cummins and Mrs. Agnes Cummins. Regd. office: 4, Corporation Street, Lincoln.

Normanton Radio (Derby), Ltd.—Private company. Registered 2nd November. Capital, £5,000. Manufacturers of, and dealers in, wireless and radio sets, valves, etc. Directors: L. S. Playdon and Florence E. Playdon, and J. Aldred. Regd. office: 228, Normanton Road, Derby.

Increase of Capital

Alpha Manufacturing & Electrical Co., Ltd.—Increased by £8,000 in £1 5½ per cent cumulative preference shares, beyond the registered capital of £7,000.

Companies Struck Off the Register

The names of the following companies have been struck off the Register and they are thereby dissolved:—Lane End Radio Service, Ltd.; Piezo Electric Sound, Ltd.; Barry Radio & Electrical Service, Ltd.; Portman Electrical Engineering Co., Ltd.; Tanat Valley Electricity Co., Ltd.

Companies to be Struck Off Register

The names of the following companies will be struck off the register at the expiration of three months from the dates stated unless cause is shown to the contrary—29th October: Whiteside Switchgear & Inventions, Ltd.; Belward Radio & Television Service, Ltd.; Essangee (Electrical), Ltd. 2nd November: Shirley Electrical Co., Ltd.; Southwood Electric, Ltd. 9th November: Henri's (Radio), Ltd.; Gibrico Electric, Ltd.; Williams Electric Co., Ltd.

Bankruptcies

N. A. M. Settle, lately residing at 142, St. George's Road, Bolton, electrical engineer.—First meeting 30th November at the Official Receiver's Office, 20, Byrom Street, Manchester. Public examination 8th December at the Court House, Mawdsley Street, Bolton.

W. H. Collis, 40, Hulse Street, Fenton, Stoke-on-Trent, and carrying on business at 59, King Street, Fenton, Stoke-on-Trent, electrical engineer.—Trustee, Mr. F. C. Carter, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released 3rd November, 1948.

Liquidation

Sandown Radio Instruments, Ltd.—Winding up voluntarily. Liquidator, Mr. T. A. Gott, 15, Deansgate, Blackpool.

Egyptian Electrical Imports

THE Egyptian Government has issued statistics of the country's foreign trade in 1947. The values of the electrical imports for that year are given in the accompanying table, with notes of increases or decreases compared with 1946, and the chief supplying countries. The total value of this trade was £E3,013,000 against £E2,324,000 in the preceding year. It will be seen that noteworthy increases took place in power plant, radio goods and domestic appliances, the only important decreases being in batteries, accumulators and lamps. (£E = 20s. 6d.)

Class of Goods and Supplying Countries	1947 £E(000)	Inc. or dec. on 1946
Generators, motors and transformers, 1,000 kW or over	96	+ 44
From Britain	39	+ 2
„ *Switzerland*	36	+ 26
Ditto, 50 to 1,000 kW	191	+ 72
From Britain	123	+ 38
„ *United States*	10	—
Ditto, less than 50 kW	107	+ 53
Accumulators and parts	73	— 9
From Britain	27	— 18
„ *United States*	35	+ 6
Dry batteries and parts	47	— 8
Fans	30	+ 23
Radio valves	76	+ 62
Electro-medical apparatus	87	+ 29
Electric lamps up to 40 W	37	— 24
Ditto, 40 to 100 W	12	— 36
„ 100 to 500 W	19	— 3
„ 500 to over 1,000 W	1	—
Telegraph and telephone apparatus, ordinary, and parts	70	+ 22
From United Kingdom	41	— 5
Radio receiving sets	410	+ 70
From United Kingdom	196	+ 4
„ *United States*	77	+ 51
„ *Holland*	98	— 9
Radio fittings and parts	77	+ 14
Irons	20	+ 10
Insulated tubes, metal-covered	92	+ 78
Signalling apparatus	4	+ 1
Refrigerators	89	+ 50
Other domestic apparatus	76	+ 35
Cable, insulated, submarine and underground	247	— 45
From Britain	113	— 140
Wire and cable, electric, unspecified, and parts	252	+ 90
From Britain	103	— 10
Unspecified electrical apparatus	808	+ 242

STOCKS and SHARES

STOCK Exchange markets stand up stoutly to the continued international complications and uncertainties. The apprehension current a few weeks ago as to the possibility of war with Russia has subsided; is, in fact, seldom mentioned, so far as personal experience goes, in the Stock Exchange these days. The weight of money is a very present factor. It fully counteracts the caution that is still noticeable in some quarters in regard to investing capital in the face of European unsettlement. Prices on the whole remain very firm, with the gilt-edged market leading. The front-rank industrials maintain their ground, and brokers find it none too easy to secure anything like a decent line of shares such as those which institutional and similar clients are desirous of acquiring.

The Week's Price Changes

Out of the 30 changes in price on the week in the lists with which these notes are concerned, two dozen are in favour of holders. The improvements range from 6d. in the cases of Brush, 7s., Crompton Parkinson, 27s. 6d., Allen West, 11s., and British Thermostat, 26s. 9d., to 7s. 6d. in Tube Investment, 6⅛, while gains of 3s. 9d. made Murex 97s. 6d. and Electric Construction 53s. 9d. J. Lucas at 85s. are 2s. 6d. up. A number of rises of ⅛ have occurred; amongst them Reyrolle, 62s. 6d., Lancashire Dynamo, 5 3/16, Burco 24s. 6d., and English Electric, 48s. 9d. General Electrics advanced to 88s. 6d., Telegraph Construction to 46s., Scottish Cables to 24s. 3d. and Aberdare Cables to 65s. 6d. Decca shares are 1s. 6d. up at 22s., and Associated Electric at 77s. are a florin higher. Falls are few and insignificant.

Tube Investment Results

Preliminary figures published last week by Tube Investments are particularly satisfactory since they followed closely the removal of any doubts that stockholders may have felt in connection with the Steel Bill. An increase in group profits to over the £5 million mark indicates that the dividend could have been advanced well beyond 25 per cent without offending conservative principles. At £6⅛ the shares pay £3 15s. 6d. per cent on the money. Reference was made here last week to the unusual situation which might arise if the Steel Bill were implemented, through the cross-holdings of liaison shares between Tube Investments and Stewarts & Lloyds, who are on the Government's nationalization list.

General Cable Manufacturing

Up to last week, no bargains had been marked in General Cable 5s. ordinary since more than a month ago, when they changed hands at 38s. In view of this comparative inactivity, it is interesting to note that 1,000 shares are currently in the market at 40s., to yield 6¼ per cent on the 50 per cent dividend paid for the year ended September, 1947. That distribution doubled the previous rate, which followed a long succession of 10 to 15 per cent payments; consequently it attracted a good deal of attention at about this time last year. It was covered by earnings equal to well over 100 per cent on the £75,000 ordinary capital. This year's interim has been maintained at 20 per cent; the final is due before Christmas. A few hundred of the 6 per cent 10s. preference are offered at 15s. 6d.

Miscellaneous Matters

Scophony 1s. shares, now 2s., have been active as a result of the report of developments in theatre television for the A.B.C. Cinema group. An interim of 4 per cent is being paid on the recently marketed 5s. shares of Hackbridge & Hewittic: they stand at 11s. and return practically 5½ per cent on the last full distribution of 12 per cent. The sellers' market, he says, seems to be ended and trade is on a more competitive level. With the 1s. shares at 16s., the yield of £9 7s. 6d. per cent is one of the highest in the electrical markets.

Telephone Shares

That Automatic Telephone & Electric £1 ordinary, quoted at 64s., are amongst highly-valued industrials, is indicated by the modest yield of a florin under 4 per cent. The "B" deferred shares, which participate equally with the ordinary after each in turn has received 6 per cent, can be bought 5s. 6d. cheaper, and return nearly 4¼ per cent. B.I.C. hold the "A" deferred capital. The regular 12½ per cent dividend on both classes was paid last time out of group earnings of over 60 per cent. Ericssons' dividend of 20 per cent tax free, paid since the beginning of the war, is still 5 per cent below the pre-war rate. At 44s. for the 5s. shares, the yield is £2 5s. 6d. per cent net, equal to £4 2s. 9d. per cent less tax at 9s. Earnings last year worked out at 26½ per cent, tax free.

Telephone Properties

Telephone Properties, Ltd., formerly the Venezuela Telephone & Electrical Appliances Co., Ltd., paid its regular 6 per cent dividend on the ordinary shares a week ago, and this revives the question as to why the company's £1 shares should be obtainable at 17s., or a shade less, to give a yield of £7 1s. 2d. per cent on the money. Sir Alexander Roger is the chairman, and in his speech at the recent meeting he explained the apparent reduction in the company's total income for 1946, of £83,778 to £40,177. The reason, he stated, is that some postponement of remittances on dividend account had occurred, but that such remittances have been recommenced and, of the £46,000 due, the unremitted portion at date was £30,700.

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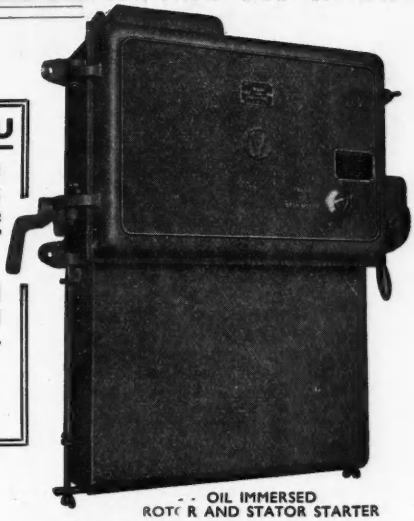

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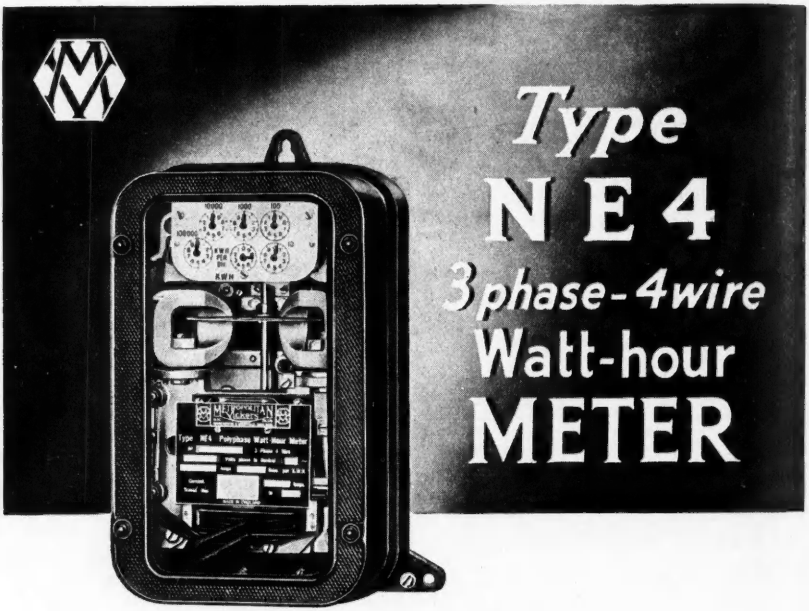

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Electricity Supply

Proposed Chadderton Extension. Meaford Station Completed.

Chadderton.—EXTENSION OF POWER STATION.—The British Electricity Authority has applied to the Minister of Fuel and Power for consent to the extension of the Chadderton generating station by the installation of a 60,000-kW turbo-alternator with ancillary plant and two 360,000-lb-per-hr boilers; the construction of a reinforced concrete cooling tower, the necessary buildings, and civil engineering works; and the addition to the existing site of about 58 acres of land.

Doncaster.—POWER STATION SITE.—Objections to the proposal to construct a new power station at Crimpsall Ings have been replied to by the British Electricity Authority. With regard to the alternative site at Thorpe Marsh, Barnby Dun, suggested by the Doncaster Civic Trust, the B.E.A. says that this would entail an additional cost of £130,000. One of the Trust's chief fears was that damage would be done to the Parish Church by smoke, but the B.E.A. states that measures will be taken to combat the nuisance of dust, sulphur, smoke and grit.

Jarrow. — ESTATE LIGHTING. — The Town Council has applied for sanction to borrow £855 for nineteen electric street lighting units on the Bilton Hall estate.

London.—STREET LIGHTING.—Two outstanding street-lighting installations have recently been commissioned in London, one at Islington and the other at Bethnal Green, the fittings being supplied in both cases by the British Thomson-Houston Co. At Bethnal Green, thirty-six "Mazdalux Dilen" lanterns, each housing 400-W mercury vapour lamps, have been suspended from specially designed bracket arms fixed to existing trolley-bus columns. In the Islington installation eighteen "Mazdalux" three-lamp fluorescent "warm-white" lanterns have been installed in a busy shopping centre between the Camden Road and Seven Sisters Road crossings. The road width at this point is about 50 ft and a "double staggered" formation has been adopted with spacing of 120 ft between each unit.

Meaford (Staffs.).—POWER STATION COMPLETED.—The fourth and last G.E.C. turbo-alternator set was put into operation at the Meaford station on 30th October, thus completing this 120,000-kW generating station. Work on the station was started early in 1945 and the first three sets were put into commercial operation in January, February and July of this year.

North Scotland.—SERVING SPARSELY POPULATED AREA.—The North of Scotland Hydro-Electric Board's distribution lines from Lochalsh are to be extended on the Island of Skye and on the mainland. These extensions will serve places as far apart as Portree and Calligarry on the Island of Skye, Applecross and Shieldaig in Ross-shire and Glenelg and Arnisdale in Inverness-shire, an area with a widely dispersed population of about 7,500. Over 2,100 people in the area, including 500 in Skye, are already benefiting by a supply of electricity from the Lochalsh diesel generating station. The network will shortly be carrying electricity produced by the Board's hydro-electric station at Nostie Bridge. As in all the areas recently supplied by the Board, the new consumers in the Lochalsh area are taking a great interest in the supply of power to their homes. Already over 45 per cent are cooking by electricity and there has been a ready sale for other household appliances.

Overseas

Australia.—SUPPLY INDUSTRY STATISTICS.—The Acting Commonwealth Statistician (Mr. S. R. Carver) has released figures regarding the Australian electricity supply industry. These show that the number of persons employed in the Commonwealth increased from 6,498 in 1938-39 to 7,718 in 1946-47 and salaries and wages paid were up from £1,877,000 to £2,966,000. Cost of fuel, etc., used had increased from £3,239,000 to £7,454,000; and the value of other materials used from £519,000 to £1,263,000. Total value of output was up from £12,483,000 to £21,977,000; and the value of production (output minus cost of raw materials, etc.) increased from £8,725,000 to £13,260,000.

The total electricity generated during 1946-47 was 7,527 million kWh and the installed capacity of generators was 2,174,406 kW (effective capacity 1,934,905 kW), the maximum load being 1,742,962 kW.

DARWIN PROJECT.—It is reported that the headwaters of the Adelaide River, 72 miles inland from Darwin, may soon be harnessed to supply power to the new Darwin. A surveyor from the Department of Works and Housing has selected a site for the erection of a £1,000,000 hydro-electric plant. The scheme is a long-range one and will bring power and light to Darwin and its suburbs when the present diesel plant cannot cope with the demand.

Electricity Output

THE output of solid-fuel fired generating stations in the week ended 5th November was 891·6 million kWh, as compared with 887·0 million kWh in the preceding week, and 804·7 million for the week ended 7th November, 1947. Stocks of coal at electricity undertakings at 6th November totalled 4,469,800 tons.

Next Week's Events

Monday, 22nd November

BRISTOL.—Grand Hotel, 6 p.m. I.E.E. Western Utilization Group. "The Application of Electricity to Horticulture," by C. A. Cameron Brown and E. W. Golding.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Informal meeting. Discussion on "Single-Phase to Three-Phase Conversion Systems," opened by A. N. D. Kerr.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Some Projects favourable to Direct-Current Transmission and the Role of the British Electrical Industry in relation thereto," by F. J. Erroll and Lord Forrester.

SHEFFIELD.—At the Sheffield Metallurgical Club, 7.30 p.m. Junior Institution of Engineers (Sheffield and District Section). Presidential address by P. W. McGuire.

Tuesday, 23rd November

COVENTRY.—Coventry Electric Club. "KVA in the U.S.A.," by C. F. Peirson.

GLASGOW.—Royal Technical College, George Street, 7 p.m. I.E.E. Scottish Centre. "Standardization of Switchgear," by D. E. Lambert and J. Christie.

LEEDS.—City Museum Hall, Park Row, 7 p.m. I.E.E. North Midland Centre. Film entitled "Atomic Physics."

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Informal lecture on "Printed Circuits, including Miniature Components and Sub-Miniature Valves," by J. E. Rhys-Jones.

LUTON.—Assembly Room, Town Hall, 7.30 p.m. Luton Electrical Society. "Some Aspects of Modern Lighting," by L. H Hubble.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilization Group. "The Design of Contactors with regard to their Industrial Applications," by B. Feldbauer.

TREFOREST.—School of Mines, 6.30 p.m. I.E.E. Cardiff Students' Section. "Short Circuit Testing of Switchgear," by J. Humphries.

Wednesday, 24th November

BARNSLEY.—I.E.E. Sheffield Sub-Centre, 6.15 p.m. "Electric Traction on the Southern Railway," by C. M. Cock.

BELFAST.—Belfast Association of Engineers. "Air Conditioning and its relation to the Flax Spinning Industry," by S. Holt.

HEBBURN-ON-TYNE. — I.E.E. North-Eastern Students' Section, 7 p.m. Visit to Pyrotenax, Ltd.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. The Students' Lecture. "Patents and the Electrical Engineer," by L. H. A. Carr.

L.T.R. Headquarters Refreshment Club, 8th Floor, Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. "The Use of Gas Pressure in Cables," by J. P. Harding.

PRESTON.—Harris Institute, 6.45 p.m. I.E.E. North-Western Centre. "The Economic Utilization of Electricity in Great Britain," by R. B. Giles.

Thursday, 25th November

KETTERING.—I.E.E. East Midland Centre, 6.30 p.m. "The Application of Electricity to Horticulture," by C. A. Cameron Brown and E. W. Golding.

LONDON.—Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon to Mr. J. F. Shipley.

MANCHESTER.—College of Technology, 7 p.m. Institution of Mechanical Engineers, North-Western Branch. Films on "Atomic Physics." (I.E.E. members invited.)

NEWCASTLE-ON-TYNE — Royal Station Hotel. I.E.E. North-Eastern Centre. Annual dinner and visit of president.

Friday, 26th November

GLASGOW.—Electrical Society of Glasgow. Whist drive and dance.

MIDDLESBROUGH.—Corporation Hotel, 7.30 p.m. I.E.E. Tees-Side Sub-Centre. Annual dinner and visit of President.

Saturday, 27th November

LONDON.—I.E.E. London Students' Section, 10.30 a.m. Visit to Arthur Guinness Son & Co., Ltd., Park Royal, N.W.10.

Principles of Ventilation

THE ventilation of buildings was the subject dealt with by MR. R. H. HOLBECHE last week at a joint meeting of the Association of Supervising Electrical Engineers and the Institution of Engineers-in-Charge.

The lecture commenced with an outline of physiological principles concerning human sensations of comfort in enclosed spaces and then referred to British and American research into effective temperatures and the construction of "comfort charts" for various combinations of conditions. It was explained that health and comfort could usually be catered for quite satisfactorily by maintaining an adequate exchange of fresh air and the lecturer proceeded to comment on different recommendations about volume, hourly rates of change, heat loss and movement of ventilating air.

The lecturer concluded by indicating that whether cleaning the air and regulating its relative humidity were really necessary depended upon environment and circumstances in individual cases.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1944

BRITISH Thomson-Houston Co., Ltd., E. W. Forster, and A. L. Whiteley.—"Protective devices for electric circuits." 10842. 6th June, 1944. (611206.)

Standard Telephones & Cables, Ltd., and M. L. Gayford.—"Microphones." 16408. 29th August, 1944. (611209.)

Marconi's Wireless Telegraph Co., Ltd.—"Electron-discharge device and associated circuit." 22918. 19th November, 1943. (611505.)

1945

Igranic Electric Co., Ltd.—"Electronic energy conversion and control system." 8858/9. 17th April, 1944. (611104/5.) "Electric motor control systems." 12166. 24th May, 1944. (611509.)

Marconi's Wireless Telegraph Co., Ltd.—"Magnetron electron-discharge devices." 16981. 19th November, 1943. (611511.) "Angular velocity modulated radio system including means for reducing undesired amplitude modulation." 18982. 17th June, 1943. (611512.) "Systems for forming images of heat-radiating objects." 19113. 28th December, 1943. (611513.)

Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauney & Cirey.—"Centrifugal electric furnaces." 19803. 10th April, 1941. (611217.)

Standard Telephones & Cables, Ltd.—"Automatic alarm signalling system." 20577. 15th August, 1944. (611219.)

Aktiebolaget Kanthal.—"Heat-resisting machinable alloy for use as electric resistance material for high temperatures as well as for manufacturing details of construction exposed to high temperatures." 22890. 10th March, 1945. (611515.)

Philco Radio & Television Corporation.—"Refrigerating apparatus." 23002. 29th September, 1944. (611311.)

Compagnie Electro-Mecanique.—"Device for measuring physical quantities by means of a direct-current intensity proportional thereto." 24451. 2nd April, 1943. (611107.)

E. P. Newton (American Bosch Corporation).—"Electric coils and methods of making electric coils." 25898. 4th October, 1945. (611221.)

Compagnie pour la Fabrication des Compteurs et Material d'Usines à Gaz.—"Television analysers with slow moving electrons." 26336. 8th June, 1944. (Cognate application 26337/45.) (611222.)

Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude-Paz & Silva.—"System for supplying electrical-discharge apparatus." 27792. 15th January, 1942. (611225.)

Standard Telephones & Cables, Ltd., and C. H. Foulkes.—"Thermal delay switches." 27899. 23rd October, 1945. (611412.)

E. R. Wigan.—"Microphones." 29607. 6th November, 1945. (611414.)

Naamlooze Vennootschap Fabriek van Electrische Apparaten Voorheen F. Hazemeijer & Co.—"Enclosed electric switchgear." 30728. 11th June, 1941. (611229.)

Brush Development Co.—"Piezo-electric crystal elements and units and piezo-electric transducers and devices." 30887. 18th November, 1944. (611415.)

Philco Radio & Television Corporation.—"Ultra-high-frequency measuring device." 34709. 20th June, 1944. (611522.)

Farnsworth Television & Radio Corporation.—"High vacuum electron-discharge device." 35298. 29th December, 1944. (611523.)

1946

Naamlooze Vennootschap Electro-Technische Industrie Voorheen W. Smit & Co.—"Electric or diesel-electric jib cranes." 800. 14th September, 1943. (611525.)

A. Podmore and B. Alston.—"Electrical condensers." 1242. 14th January, 1946. (611526.)

A. Reyrolle & Co., Ltd., J. W. Hibbert, A. T. Robertson and C. Beveridge.—"Control of driving means including electric motors." 2242. 23rd January, 1946. (611527.)

Marconi's Wireless Telegraph Co., Ltd.—"Variable reactances of the electron-discharge tube type." 5932. 30th April, 1943. (611236.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—"Device for artificially producing speech sounds by electrical means." 6243. 20th June, 1941. (611533.)

British Thomson-Houston Co., Ltd.—"Compound dielectric materials." 6848. 7th March, 1945. (611238.)

Babcock & Wilcox, Ltd.—"Temperature regulation of superheated vapour." 9469. 28th March, 1945. (611541.)

Johnson, Matthey & Co., Ltd., and E. J. Wyeth.—"Electrical resistors." 10877. 9th April, 1946. (611250.)

Communications Patents, Ltd., and L. P. Learney.—"Tone-arm operated electrical switching means for gramophones and like apparatus." 11306. 12th April 1946. (611327.)

General Electric Co., Ltd., and W. Harrison.—"Electric couplings." 11325. 12th April, 1946. (Cognate application 34095/46.) (611251.)

Landis & Gyr Soc. Anon.—"Toggle lever more especially designed for the releasing of automatic electric switches." 12080. 3rd May, 1945. (611115.)

E. Booth and M. B. Booth.—"Safety measures for electrically-driven machine-tools." 12165. 20th April, 1946. (611130.)

R. C. de Holzer.—"Radio-frequency inductors or transformers." 12177. 22nd April, 1946. (611132.)

Ultra Electric, Ltd., E. G. Fookes, and D. F. Self.—"Multi-bank multi-way electric switches." 12194. 23rd April, 1946. (611133.)

Whessoe, Ltd., and A. Puttick.—"Apparatus for the electrical precipitation of suspended particles from gases." 12227. 23rd April, 1946. (611137.)

Burgess Battery Co.—"Electrical reciprocating tools." 12233. 18th May, 1945. (611138.)

Townson & Mercer, Ltd., R. B. Brock and L. T. Townson.—"Electrically boost-heated ovens." 12239. 23rd April, 1946. (611141.)

L. P. Lockwood.—"Electric contact elements and fuses, cutouts, links and the like comprising such elements." 12242. 23rd April, 1946. (611142.)

R. R. S. White.—"Automatic electric toasters." 12244. 23rd April, 1946. (611144.)

R. R. Franz and R. T. Franz.—"Acid-level indicator and electrolyte spray absorber for storage batteries." 12250. 23rd April, 1946. (611147.)

E. Allwood.—"Mangetic switch to eliminate friction in the operation of switch contacts in telephones." 12313. 8th August, 1946. (611163.)

Westinghouse Electric International Co.—"Electric motor control systems." 12350. 19th September, 1944. (611172.)

A. M. B. Charlin.—"Acoustic instruments such as loud-speakers and directional microphones." 12391 5th April, 1939. (611179.)

Hoover, Ltd.—"Suction cleaners." 12459/60. 26th April, 1945. (611191/2.)

American Air Filter Co., Inc.—"Electrical dust-precipitating units." 12473. 1st May, 1945. (611428.)

British Thomson-Houston Co., Ltd.—"Calling and noise suppression circuits for radio receivers." 12499. 25th April, 1945. (611203.). "Electric capacitors." 12500. 26th April, 1945. (611254.)

Carr Fastener Co., Ltd., and C. W. Heath.—"Mounting strips for electrical wiring tags." 12504. 25th April, 1946. (611257.)

Svenska Aktiebolaget Gas-Accumulator.—"Thermionic amplifier control and modulating stages and the like." 12518. 28th October, 1944. (611330.)

Sperry Gyroscope Co., Inc.—"Adjusting or tuning

mechanisms for electron-discharge devices." 12525. 2nd May, 1945. (611260.)

A. M. B. Charlin.—"Acoustic instruments such as loud-speakers and directional microphones." 12516. 7th October, 1943. (Addition to 611179.) (611329.)

British Thomson-Houston Co., Ltd.—"Fluid-cooled bearings and the like." 12611. 28th April, 1945. (611273.)

Chicago Pneumatic Tool Co.—"Electric limit switch." 12639. 24th July, 1945. (611281.)

General Electric Co., Ltd., A. Pearson and L. Rollin.—"Cathodic sputtering." 12645. 26th April, 1946. (611282.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—"Electric accumulators." 12659. 30th April, 1945. (611286.)

S. L. Miller.—"Electrical musical instruments." 12668. 26th April, 1946. (611288.)

Acieries de Gennevilliers.—"Trolley pole head for collecting electric current from overhead conductors." 12686. 1st February, 1946. (611295.)

Standard Telephones & Cables, Ltd.—"Vacuum tube voltmeter." 12706. 2nd May, 1945. (611333.)

Standard Telephones & Cables, Ltd., W. W. Marsh and R. R. Back.—"Electric-discharge devices." 12708. 26th April, 1946. (611433.)

Thorn Electrical Industries, Ltd., and J. W. Strange.—"Starting switches and circuit arrangements for electric-discharge devices." 12719. 26th April, 1946. (611298.)

Thorn Electrical Industries, Ltd., and A. P. Rice.—"Luminescent materials." 12720. 26th April, 1946. (611334.)

Gemeente Amsterdam.—"Device for testing apparatus by means of a high current and high voltage supplied by separate sources of energy." 12721. 7th October, 1940. (611299.)

Radio Corporation of America.—"Receivers for angle-modulated carrier waves." 12732. 27th April, 1945. (611335.)

British Insulated Callender's Cables, Ltd., and S. J. Bryce.—"Clip for securing electric cables, wiring fittings and the like to metal girders." 12759/60. 27th April, 1946. (611337/8.)

J. A. Crabtree & Co., Ltd., and R. W. Morgan.—"Mounting of electrical accessories in metal boxes." 12764. 27th April, 1946. (611339.)

Stackpole Carbon Co.—"Formers for electric inductance and like coils." 12821. 5th May, 1945 (611347.)

F. Tench (Automatique Electrique Soc. Anon.).—"Automatic switches for use in telephone or like systems." 12943. 30th April, 1946. (611368.)

J. P. Moulson.—"Means for clamping heating elements in electrically-heated apparatus." 12962. 30th April, 1946. (611374.)

General Motors Corporation.—"Electric motor driven screw-and-nut mechanism." 12968. 1st May, 1945. (611448.)

Philips Lamps, Ltd.—"Arc welding apparatus fed with alternating-current." 12971. 23rd December, 1941. (611378.) "Electric-discharge tubes." 12973. 18th March, 1942. (611379.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—"Electric vibrators and like contact-makers." 12977. 4th February, 1942. (611380.)

Philips Lamps, Ltd.—"Thermionic tubes." 12981. 1st May, 1945. (611381.) "Source of radiation comprising a luminescent substance and process of preparing such a substance." 12983. 1st May, 1945. (611382.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—"Resilient members having parallel terminal surfaces." 12992. 2nd May, 1945. (611449.)

Philips Lamps, Ltd.—"Electric-discharge tubes." 12997. 2nd May, 1945. (611383.)

Bendix Aviation Corporation.—"Electrical contact brush assemblies." 13014. 8th May, 1946. (611450.)

Westinghouse Electric International Co.—"Electric regulators." 13029. 1st May, 1945. (611547.) "Electric circuit interrupters." 13031. 30th April, 1945. (Cognate application 13032/46.) (611388.)

Standard Telephones & Cables, Ltd., and A. H. Roche.—"Thermionic valve amplifiers with negative feedback." 13043. 30th April, 1946. (611390.)

Standard Telephones & Cables, Ltd.—"Thermionic valve amplifier circuit with multiple feedback." 13044. 30th April, 1945. (611391.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Apparatus for locating a target." 13048. 30th April, 1946. (611301.)

British Thomson-Houston Co., Ltd.—"Pulse generators." 13049. 11th October, 1944. (611392.)

Hazeltine Corporation.—"Electrical connectors for coaxial transmission lines." 13065. 19th May, 1945. (611393.)

Chloride Electrical Storage Co., Ltd., and R. Gray.—"Device for adjusting the level of electrolyte in accumulators." 13070. 30th April, 1946. (611395.) "Accumulator batteries." 13071. 30th April, 1946. (611396.)

Soc. Francaise Radio-Electrique.—"System for controlling the frequency of oscillators before operating in synchronism particularly radio diffusion emitters on communal wavelengths." 13081. 4th November, 1939. (611548.)

Det Norske Aktieselskab for Elektrokemisk Industri.—"Continuous electrodes for electric furnaces." 13098. 13th July, 1939. (Addition to 526696.) (611455.)

W. Sanders & Co. (Wednesbury), Ltd., and G. H. Bayliss.—"Electrical fused plugs." 13112. 1st May, 1946. (611457.)

J. Mowlem & Co., Ltd., and A. P. M. Bennett.—"Earth electrodes." 13139. 1st May, 1946. (611460.)

General Electric Co., Ltd., and I. Jenkins.—"Powder metallurgical processes." 13159. 1st May, 1946. (611466.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—"Shielded high-frequency cables." 13161. 2nd February, 1942. (611468.)

Philips Lamps, Ltd.—"Method of providing vacuum vessels such as electric-discharge tubes with a getter-layer." 13165. 4th May, 1945. (611469.)

Kodak, Ltd., H. M. Ross and A. L. Shuffrey.—"Electronic amplifiers for direct currents." 13177. 1st May, 1946. (611557.)

British Thomson-Houston Co., Ltd.—"Centrifugal electric switches." 13181. 1st May, 1945. (611470.)

E. P. Newton (Telefonaktiebolaget L. M. Ericsson).—"Telephone instruments." 13198. 1st May, 1946. (611558.)

British Insulated Callender's Cables, Ltd., and R. W. Blades.—"Bonding and earthing device for a screened electric cable." 13216. 1st May, 1946. (611474.)

Marconi's Wireless Telegraph Co., Ltd.—"Radio and like receivers." 13239. 2nd May, 1945. (611564.)

Udylite Corporation.—"Electrodeposition of nickel from aqueous acidic nickel baths." 13288. 7th July, 1945. (611483.)

R. Nuttall.—"Electric irons." 13291. 2nd May, 1946. (611485.)

Standard Telephones & Cables, Ltd.—"Electric pulse time modulators." 13359. 19th May, 1944. (611568.)

M.K. Electric, Ltd., C. L. Arnold and R. W. Dowsett.—"Electrical socket contacts." 13370. 2nd May, 1946. (611497.)

British Thomson-Houston Co., Ltd.—"Ironing-machines." 13694. 7th May, 1945. (611591.)

Amended Specification

L. B. Mullet.—"Ultra-high-frequency apparatus." (597217.)

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers, which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

Turkey.—An Istanbul firm, able to obtain an import licence, wishes to get in touch with manufacturers of fluorescent lamps and equipment. (X.202.)

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Argentina. — BUENOS AIRES. — 4th January. Directorate-General of Water and Electrical Power. Equipment for hydro-electric station, including two water turbines coupled to alternators, switchboards, internal electrical installation, indoor transformer station, overhead crane and lift. (E.P.D. 42855/48. Com./1346).*

Argentine Department of Sanitary Works. The date for tenders for 630 electric pumps for deep wells and l.v. switchboards, etc., has been extended to 13th January, 1949. (E.P.D. 42010/48. Com./1096A).*

Ely.—27th November. R.D.C. Wiring of about 280 houses. L. J. Godden, surveyor, 11, Lynn Road.

Hartismere.—27th November. Wiring of 29 dwellings on three sites. Surveyor, Lambeth Street, Eye.

India.—3rd December. India Store Department (London). Enamelled copper winding wires. (See this issue.)

Newcastle-on-Tyne.—City Council. Alterations to electric lighting and the installation of electric heating at Laing Art Gallery. Plans by the city estate and property surveyor, Town Hall.

Peterborough.—Joint Education Board. Installation of lighting, power, telephones, clocks and battery services at the new Technical College. (See this issue.)

Stepney.—24th November. Borough Council. Materials, plant, etc., for installing five electrically operated passenger lifts in three blocks of flats in Tarling Street. Borough engineer, London Fruit Exchange, Duval Street, Spitalfields, E.1.

* Specifications may be inspected at the Export Promotion Department, Thames House North, Millbank, S.W.1.

Orders Placed

Durham.—County Council. Accepted. Traffic signals at Barnard Castle Bridge (£1,508). —Automatic Telephone & Electric Co.

London.—HAMMERSMITH.—Works Committee. Accepted. Time switches (£916).—Venner Time Switches.

L.C.C. Accepted. Electrical installations in schools:—Woodhill School, Woolwich.—London Electricity Board. Conway Road School, Woolwich. — Electrical Contracts (London).

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldridge (Staffs.).—County school, Pheasey estate, Great Barr (£52,540) for C.C.; J. & F. Wootton, Ltd., builders, Pinfold, Walsall.

Arundel.—Houses (95), Canada Road; T. Greenfield, architect, Newstead, Midhurst.

Bebington.—Factory for Metal Industries, Ltd.; A. E. Shenna, architect, North House, 17, North John Street, Liverpool, 2.

Birkenhead. — School, Bedford Drive, Rock Ferry (£92,876); Lloyd & Cross, builders.

Blackpool.—Three-storey extension, Waterloo Road; Lawrence-Hilton, Ltd., manufacturers, 481, Waterloo Road, South Shore.

Brighton.—School, Woodingdean (£68,337) for the Town Council; Walter Lee Construction Co., Ltd., builders, Valley Road, Holmgate, Clay Cross.

Bristol.—New works (£1,000,000), Chittening estate, Avonmouth; Philiblack, Ltd., 15, Moorgate, E.C.2.

Houses (400 Cornish unit type) on nine sites; city architect.

Bushey Heath.—Day nursery and health centre, Haydon Hill, for Hertfordshire C.C.; C. H Aslin, county architect.

Chessington.—Houses (150) and flats (189), Maple Road, for Kingston Corporation; borough engineer.

Chester.—Secondary school, Handbridge (£94,230); H. Joyce & Sons, Ltd., builders, Martins Bank Chambers, Clifton St., Blackpool.

Chigwell.—Secondary school, Grange Hill (£89,999); Thomas Bates & Son, builders, Church Road, Harold Wood.

Dover.—Permanent houses (50); J. A. Johnson, town clerk, Brook House.

Dumbarton.—Fire station and administrative offices (£32,385); burgh engineer.

Easingwold.—Ward blocks at Claypenny Colony for Board of Control (£100,000); J. Catchpole, county architect, County offices, Northallerton.

Eastbourne.—Permanent houses (68), Chatfield-Davis estate; borough engineer, 2-4, Saffrons Road.

Gateshead.—Remodelling ward blocks at the Bensham General Hospital, Gateshead (£60,500); North-Eastern Hospital Board, Osborne Road, Newcastle-on-Tyne.

Gosforth.—Flats (42), Grange Lane, for U.D.C.; Tasker & Child, architects, 25, New Bridge Street, Newcastle-on-Tyne.

Guildford.—Research laboratories, Henley Park; Vokes, Ltd. engineers.

Hereford.—Factory, Holmer Street, Wilde & Son, agricultural engineers; Scriven & Partners, architects, King Street.

Hexham-on-Tyne.—Hotel to be converted into a teachers' training college; W. W. Tasker, County Hall, Newcastle.

Manchester.—Additions to Victoria University, Burlington Street and Wright Street, Chorlton-upon-Medlock for governors; T. Worthington & Sons, architects, 178, Oxford Street.

Office block, Ashton New Road, Clayton; R. W. Morrison, Ltd., Sheet Metal Works, Holland Street.

Mansfield Woodhouse.—Houses (48), Cox's Lane and George Street, Forest Town; Lawrence Walker, U.D.C. surveyor, Council Offices, Manor House.

Middlesbrough.—Houses (102), Thorntree estate (sections 19 and 20); borough engineer.

Middleton.—Houses (68); J. Pollard, borough engineer, Town Hall.

Newcastle (Staffs.).—Cinema; A. Cotton & Son, architects, Piccadilly, Tunstall.

Egg packing station, Cross Heath; North Staffs Egg Producers, Ltd., 201, London Road, Stoke-on-Trent.

Northumberland.—Police houses (51) in various parts of the county; county architect, County Hall, Newcastle-on-Tyne.

Norwich.—School, Tuckswood; H. G. Hannaford, architect, City Hall.

Oldham.—Additions to Orme Mills, Waterhead, for Lancashire Cotton Corporation; J. Hartley, builder, Cobden Street, Chadderton.

Rebuilding engineering works, Wrigley Street; Buckley & Taylor, Ltd., Castle Ironworks.

Radcliffe.—Houses (78), Ainsworth; T. Kay, borough surveyor, Municipal Buildings.

Rotherham.—Technical college; E. J. Manson, borough engineer, Municipal Buildings.

Shettleston.—New works and machine shops; Wagon Repairs, Ltd., John Bright Street, Birmingham.

South Molton.—Secondary school, for C.C.; W. J. Channing & Son, builders, Burnham-on-Sea.

South Shields. — Civic restaurant at the corner of Pollard Street and Ocean Road for the T.C.; borough engineer.

Stafford.—Houses (44), Rising Brook estate, for T.C.; borough engineer.

Offices, Lichfield Road, for Staffs C.C.; A. C. H. Stillman, county architect, Earl Street.

Stockport.—Alterations and additions, Booth Street Cleansing Depot (£10,200); Schofield & Thompson, Ltd., builders, Hartley Street, Oldham.

Stretford.—Houses (98) and flats (36), Moss Park Road; A. H. Perry, borough surveyor.

Sunderland.—Grammar school; J. Murray, architect, Education Offices, John Street.

Houses (140), Pennywell, for the T.C.; Lane, Fox & Co., Ltd., builders, Fulwell.

Thame.—Conversions at Old Institution for training college; H. S. Goodhart-Rendel & Partners, 12, Crawford Street, London, W.1.

Waddington (Lincs).—Junior and infants' county schools; C. B. Metcalfe, county architect, County Offices, Sleaford.

Wath-upon-Dearne.—Permanent houses (64); W. E. Haigh, U.D.C. surveyor, Town Hall.

Whitby.—County primary school for North Riding E.C. (£48,250); Jaram & Son, builders, 20a, Gladstone Street, Scarborough.

Workington.—Houses (102), Westfield housing estate, for T.C. (£128,709); John Laing & Son, Ltd., builders, Dalston Road, Carlisle.

Wycombe.—Permanent houses (40) in four groups, Hazlemere site; J. M. Smith, architect to R.D.C., 28, High Street.

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from 10th November:—

ROWLWAY. No. 665,305. Class 7. Electrically operated butter churns, and agricultural implements of the larger kind.—Sedles-Combe Engineering Co., Ltd., The Street, Sedlescombe, near Battle, Sussex.

FERRAXCUBE.—No. 659,055. Class 9. Magnetic cores of iron and magnetic cores of chemical compounds of iron for use in electrical and wireless apparatus and instruments and in telephonic, telegraphic, signalling and scientific apparatus.—Mullard Electronic Products, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

UNILATOR. No. 662,423. Class 9. Electric capacitors made of ceramics or of mica.—United Insulator Co., Ltd., Oakcroft Road, Tolworth, Surbiton, Surrey.

MAGNAL. No. 666,047. Class 9. Electric switches (manually or thermostatically controlled), electric switch boxes, thermostats, electric fuses and electric fuse boxes.—Magnal Products, Ltd., Tower Road, Warmley, Glos.

H. C. ATKINS (design). No. 666,112. HIGHWAYMAN. No. 666,113. Class 9. Wireless telephonic apparatus.—Hubert Cyril Atkins, trading as H. C. Atkins Laboratories, 32, Cumberland Road, Kew Gardens, Surrey.

MOTOROLA. No. 655,819. Class 11. Electrically operated petrol-burning apparatus for heating vehicles and defrosting apparatus incorporating electric heating elements, for use in vehicles.—Motorola Inc., Chicago, U.S.A. Address for service: c/o Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.